SOUTHERN POWER AND INDUSTRY

Man page 120 AUGUST, 195

In This Issue

REPORTS FROM SOUTHERN PLANTS

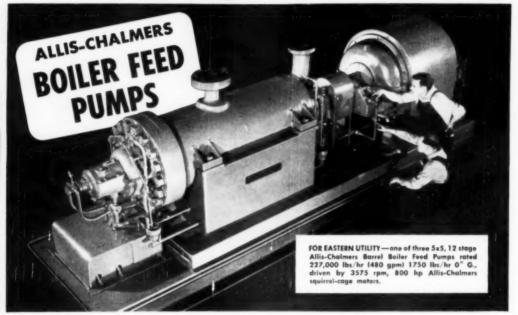
Florida—Heat Pump in Citrus Plant Heat for Evaporation: Refrigeration for Cooling	48
Texas—Welding Methods Positioners for 31 Ton Sections	51
South Carolina—Turbine Maintenance Maintenance to Support Capacity and Efficiency	55
Maryland—A.S.M.E. Baltimore Meeting Radial Type Engines, and Corrosion Problems	60
Alabama—Process Steam Electric Boilers in Huntsville Plant	62
Florida—Water Treatment Boilers up to 900 psi with Low Make-Up	64
Texas—Materials Handling Imperial Sugar Cempany, Sugarland	78
Arkansas—Gas Turbine Combustor Design for Pipe Line Unit	80
SP&I Reference Data—Industrial Electronics	69

For Full Table of Contents, See Page 3

Industrial Application of Heat Pumps

See Page 48

A <u>Single</u> Responsibility for Pumping Performance!



BEAT THIS KIND OF COMBINATION

— at any price: An excellent
quality boiler feed pump, high reliability motor, and complete control—
all Allis-Chalmers built and backed!

You save time and money in negotiation, installation and operation,

ASK THE POWER PLANT USER!

Regardless of which of the 3 Allis-Chalmers boiler feed pumps described at right you finally settle on, here's the kind of maintenance operational record you can expect and get when you invest in A-C:

EASTERN UTILITY, 735 gpm pumps, "after 45,000 hours no measurable wear on shaft sleeves, rings or internal parts."

MIDWEST UTILITY, 6 x 4, 5-stage pumps, "After 82,000 hours not

.001 inch wear on any internal part."

OHIO UTILITY re-ordered three 1800 p.s.i. pumps on strength of this performance — "Only .002 inch wear on rings after 8 years operation on

pumps.

And on the motor end, a midwest Utility reports, "in over 20 years of uninterrupted service with three, 800 hp, two-pole motors driving boiler feed pumps we've had to order replacement parts just twice at a total cost averaging less than \$12 a year!"

CHOOSE FROM 3 TYPES PUMPS:

Barrel-type, for larger steam stations operating against the higher pressures, 1200 to 2500 lbs; 300 to 2000 gpm.

"Doubleton," for pressures between 1200 and 1800 p.s.i. Standard Type "M," for pressures usually under 1200 p.s.i,

BENEFITS OF "PACKAGE" INVESTMENT

Yes, for quality performance in your power plant, get hold of an Allis-Chalmers pump application engineer today. He's an expert at figuring requirements at the economy point. And he's ready to show you where and how a complete Allis-Chalmers "Power Plant Pumping Package"... pumps, motors, control, will keep you ahead in time, performance, and freedom from worry.

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Volume 68

Number 8

GIVE IT A RIDE - ON JEFFREY BELT IDLERS

Costs must be cut. No question about that . . . and no question about the economy of Jeffrey Belt Conveyors when small or large quantities of material must be handled. We can furnish them by the rod, or mile, just as the job requires. We know how to provide for reliability under tough conditions, handling of peak loads, low investment, high salvage and other things which are problems peculiar to engineering.

Hence, we say, "Give That Material A Ride on Jeffrey Idlers." They are the backbone of the belt conveyor . . . have been the choice of smart operators on thousands of jobs. They are built to take day-after-day punishment . . . have that reserve strength and durability that count for many years of satisfactory, efficient trouble-free service.

Whether yardage looms large in the estimate, or small capacity is desired, Jeffrey engineers are skilled in the application of material handling to most any job. We would like to talk things over—constructively.

Catalog No. 785 Tells All



Pivotly mounted on a supporting cross member, guide reliers are mounted on arms and extend at right angles to idler. Need only to be spaced about 20 to 50 feet apart to keep belt in per-



Used for both troughing and flat belt conveyors. Of the self-aligning, two-pulley type. Also standard return rolls pivotly mounted in ball bearings on supporting cross member. Write for full details about Jeffrey Idlers for either troughing or flat belt service.

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Complete Line of Material Handling, Processing and Mining Equipment



Steam engines—old or new—run better when lubricated with Texaco steam cylinder oils designed to meet the particular operating conditions. Operators everywhere have found this so.

You'll find the Texaco steam cylinder oils recommended for your engines will atomize completely, and protect pistons and cylinders from wear by keeping them coated with a tough lubricating film. There are oils that resist wash-off under wet steam conditions; others that stand up under the highest temperatures. You'll be sure of steam-tight rings and properly functioning valves . . . greater efficiency all around.

If you use your steam for processing, you can get Texaco steam cylinder oils especially designed to separate rapidly from exhaust or condensate.

Call in a Texaco Lubrication Engineer. He'll gladly help you select the proper lubricants to improve your steam engine performance. Contact the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TEXACO Steam Cylinder Oils

FOR EVERY OPERATING CONDITION

SOUTHERN POWER AND INDUSTRY



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CONTENTS

Heat Pump Effects Savings in Florida Citrus Plant	4
Turning Rolls Facilitate Welding in Texas Plant	. 5
How Not to Write Specifications, by Helen H. Dunham	52
Missouri Plant Cuts Handling Costs	54
A Guide to Turbine Maintenance, by Robert H. Emerick	5
Radial Type Engines and Corrosion Featured by A.S.M.E.—Baltimore	60
Electric Boilers Supply Process Steam for Alabama Plant, by Stanley Livingstone	62
A System of Water Treatment for Boilers up to 900 psi With Low Make-Up, by Charles L. Wolff and Irving Liebson	64
Feed Bags Sanitized by Dielectric Ovens	67
Electronic Circuits for the Plant Engineer, by W. C. Sealey	69
Texas Plant Cuts Handling Costs, by Francis A. Westbrook	78
Gas Turbine Combustor Developments	80

PRACTICAL DISCUSSION

Funnel for Fume Control	86	Adjusting Device for Header	88
Shop Made Metal Shaper	86	Wedgemeter Waintenance	200

DEPARTMENTS

FACTS AND TRENDS 6	NEWS OF THE MONTH 94
BUYERS INFORMATION 16	BOOKS101
TIMELY COMMENTS 45	NEW EQUIPMENT
INDUSTRY SPEAKS 47	INDEX TO ADVERTISERS 120

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Editorial and Esecutive Offices: SOUTHERN POWER & INDUSTRY, 806 PEACHTREE ST., N. E., ATLANTA S, GEORGIA

ON-All the Advantages of **SOLENOID** design

in the LARGER SIZES 6 & 7 STARTERS

In years of service, under all operating conditions, the Allen-Bradley solenoid construction has proved its superiority beyond all auestion of doubt.

Allen-Bradley has added Sizes 6 and 7 starters to the Bulletin 709 line of solenoid starters . . . with all the features that have proved so successful in smaller Allen-Bradley starters. These new units extend the Bulletin 709 horsepower ratings up to 300 hp, 220 v: 600 hp. 440-550 v. Check their many distinctive features lis ed below.

SILVER ALLOY CONTACTS

The double break, silver allay centacts never require cleaning or filinga distinct advantage over conventional copper to copper contacts.

SIMPLE, RUGGED CONSTRUCTION

These starters have no pins, pivots, hinges, or complicated mechanisms to cause trouble. The solenoid switch mechanism has only one moving part.

SMALLER SIZE

The open type Size 6 starter is less than 1/4 as large as conventional starters, and the enclosed unit takes only 58% of the floor space. Size 7 is even smaller, compared with other starters.

STEEL PANEL MOUNTING

the switch is mounted on a metal base

plate instead of a slate panel, and is self insulated. It can be quickly and easily mounted to metal surfaces withaut additional insulation.

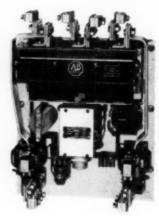
All terminals and wiring are readily accessible from the front. There is no back panel wiring.

AVAILABLE IN MANY FORMS

Size 6 and Size 7 solenoid switches can be furnished in 2 pole or 3 pole contactors, across the line starters, reversing switches, reduced voltage starters, and many other combinations where clapper type magnetic switches were previously used.

Write for Information

Allen-Bradley Co., 1328 S. Second St., Milwaukee 4, Wisconsin



Close-up of Size 7, Bulletin 709 sale noid starter. Max rating-300 hp, 220v; 600 hp, 440-550v.

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SOLENOID MOTOR CONTROL

CONSULT YOUR LOCAL ALLEN-BRADLEY REPRESENTATIVE

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Facts and Trends

FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

August, 1950

PORT LAVACA, TEXAS, location of the Point Comfort Works of Aluminum Company of America now boasts the largest single application of aluminum industrial corrugated roofing and siding to date. 18,000 squares of aluminum roofing and siding were applied at the rate of 3,000 to 6,000 sq ft per day per 7-man crew utilizing the high speed Nelson stud welding method.

Four stud welding guns were operated from a single Lincoln 300-amp welding generator with leads of 00 cable, which were held to less than 250 ft. While the simultaneous operation of any two or more guns at exactly the same instant would obviously result in an incomplete weld, experience showed that this never happened more than once or twice a day, so that the loss of time and materials was negligible compared to the savings on equipment.

- IN THE HUNTSVILLE, ALABAMA plant of the American Rubber Corporation four Livingstone steam electric boilers supply process steam for the production of rubber floor tile. Steam is generated by resistance of boiler water to the passage of current between solid metal electrodes. 6 hp, 180 lb/hr, boilers, installed near the presses to conserve space and reduce steam distribution losses, have reduced the molding cycle 40 per cent and improved consistency in color of product.
- LOUDON, TENNESSEE'S Charles H. Bacon Company's full-fashioned hosiery division has improved production through humidity control. Excessive humidity, running as high as 70 per cent in the summer, allowed nylon to stretch. Temperature changes of more than three to four degrees adversely affected operation of the full-fashioned hosiery machines.

Very satisfactory production results are now being obtained through the utilization of three Kathabar dehumidifiers tied into the air conditioning system. These units, offering a chemical means of dehumidification, maintain any desired relation between humidity and temperature.

- BIRMINGHAM, ALABAMA will be the location of the new 50,000 sq ft industrial equipment overhaul and repair shop of the Westinghouse Manufacturing and Repair Department. The new plant supplements other Westinghouse maintenance and repair shops in Atlanta, Charlotte, Baton Rouge, and Houston.
- SHAWNEE, OKLAHOMA'S \$1,500,000 television and radio tube manufacturing plant of the Sylvania Electric Products, Inc. is now under construction. The new 50,000 sq ft plant will employ 500 persons. It will more than double Shawnee's industrial payroll and is expected to add \$1 million annually to Oklahoma's financial channels.
- NEW ORLEANS, LOUISIANA'S RHEEM MFG. CO. has developed new fabricating techniques to form 55-gal drums AFTER COLOR LITHOGRAPHY AND INNER LINING. In reporting the new methods, IRON AGE notes that although the fabrication of small metal containers after lithographing and lining operations has been a standard manufacturing procedure for many years, roller-coating, handling, and drying equipment had never been designed in sufficient size and weight capacities to handle the 36 lb, 3 x 6 ft sheets of 18 gage steel of which full-size drums are made.

The unusual automatic fabricating operations, described by L. A. Reber, Plant Manager of Rheem, have not only successfully produced 55-gal drums after color lithography and non-corrosive lining, but have also accellerated single drum production nearly 100 per cent.

LATEST PEACETIME APPLICATION OF ATOMIC ENERGY refutes many recently published statements that NUCLEAR POWER IS NOT FOR THE INDIVIDUAL. Answer to the duffer's prayer is the new RADIOACTIVE GOLF BALL, which makes it possible for a caddy carrying a small, portable Geiger Counter to locate the "atomic" ball even when hidden in dense woods or deep rough. Minute quantities of radioactive materials are embedded under the cover of the hall.

Location of a lost ball can be telegraphed by the Geiger Counter by flashing a light on the instrument or by signals which the caddy can hear through head phones. Production of the activated golf balls at the B. F. Goodrich Research Center is entirely experimental and no sale is contemplated at the present time. However, there is a new Geiger Counter on the market which weighs only ten ounces and costs about \$25, the price of about 25 golf balls.

- MORE EFFICIENT UTILIZATION OF COAL AS A FUEL is evident in a recent Federal Power Commission report, showing that so far this year, all the nation's electric generating plants need, on the average, FOUR PER CENT LESS COAL than they did last year to produce THE SAME AMOUNT OF ELECTRICITY. On the average it takes a little less than ONE AND A FIFTH POUNDS OF COAL to generate ONE KILOWATT HOUR of electricity.
- BRUNSWICK, GEORGIA will be the location of a new modern \$5 million steamelectric power plant of the Georgia Power Company. Initial generating unit will have a capacity of 30,000 kw or 40,000 hp and is scheduled for operation by the middle of 1952. Plant is being designed for ultimate enlargement to four units with a total capacity of 120,000 kw.
- IN THEIR NEW HOUSTON, TEXAS PLANT, utilization of bus duct in lieu of conduit, saved the Imperial Laundry & Cleaning Co. three distribution centers and over 3,000 ft of conduit. The lead-in is the only distribution point. Initial cost was probably higher than a conduit installation, but savings will result when equipment must be moved or new equipment installed.
 Tap-ins are practical anywhere along the duct route. Flexibility and low maintenance cost are the main advantages.
- EQUIPMENT AND METHOD TRENDS -- New process for SANITIZING BURLAP FEED BAGS for reuse, utilizes HIGH FREQUENCY HEAT, which literally "cooks" disease organisms to death with no apparent detrimental effect on the life or soundness of burlap. Chemicals and steam are destructive to the fibers but saturation with dry heat produced by high frequency power is not injurious.

Maintaining proper CHROMATE CONTENT in cooling water for internal combustion engines is recommended to AVOID CORROSION. In most installations a 2000 ppm chromate content is found to keep water side free of rust and scale. On the other hand, too little chromate can do more harm than good. Dearborn's new CHROMOKIT offers a pack of chemically treated paper cards. Drop of water from the engine cooling system is dropped on the card: blue color indicates too low a percentage; gold color with a blue ring around it indicates the proper 2000 ppm.

Elliott's new large enclosed motor offers interesting COOLING DESIGN. A finned tube air-to-air heat exchanger, comprising a single rectangular unit, is located at the top of the welded-steel motor frame. Fan draws cooling air from outside the motor, through the tubes, and out the front of the motor enclosure. Air within the motor is passed over the finned tubes for cleaning or inspection; entire heat exchanger unit can be drawn out from the motor enclosure for repair or replacement.

Write the editors for additional information on any of the above items. SOUTHERN POWER & INDUSTRY 806 Peachtree St., N. E. Atlanta 5, Georgia



... The Steel Valve With A Priceless Ingredient

Into every heat of Lunkenheimer molten steel goes one ingredient that no other valve foundry can duplicate. It's not measured in ounces or pounds — but in generations... of tradition. It is pride in the kind of workmanship that has made Lunkenheimer universally respected as the one great name in valves.

Engineers are accustomed to dealing in facts—not intangibles. But every realistic engineer knows that molten steel is tricky stuff to handle. It demands more from the workman than simple attention. Quality valves—safe valves—are not made by formula alone, but by care . . . interest . . . pride in an unbroken tradition of fine workmanship. At Lunkenheimer, that tradition goes back to 1862.

Lunkenheimer's priceless ingredient will always be intangible, but it can be expressed in terms of one interesting fact: there is no instance on record where a Lunkenheimer steel valve has ruptured due to defective metal. For more facts—and for information relating to your specific steel valve application—write immediately to The Lunkenheimer Co., P. O. Box No. 360C, Annex Delivery Station, Cincinnati 14, Ohio.

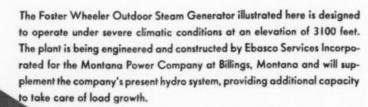
STEEL . IRON . BRONZE



LUNKENHEIMER THE ONE GREAT NAME IN VALVES

L-798-13A

"operation" SUB-ZERO



solosed firing aisle is provided and the space under the firing aisle and furnace these is housed to afford storage and shop space. The drum ends are enclosed so to house the water columns, gage glasses, safety valves, etc. Small piping the such items as instruments, controls, drains, is exclosed within ducts turn enting in the drum end enclosures, with the ducts being heated during from weather.

Plant site on the banks of the Yellowstone River

FOSTER WHEELER CORPORATION

FOSTER WHEELER
Outdoor Unit for the
MONTANA POWER COMPANY
at Billings, Montana

Model of plant

Superheat Cox at Renge. . . . 425,000 to 675,000 lb por

Pressure Superheater Comm. . 920 pc

Final Steam Temperature....

165 BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER

"We stopped both useless shutdowns and motor burnouts from Single Phasing by installing Fusetron fuses in a refrigeration compressor circuit"

Glenn F. Buschman, Manager Kirby Risk Electric Motors, Inc. Lafayette, Ind.

Mr. Buschman continues-

"In December '47 we rewound a motor for the Rund Packing Company of Lafayette, Indiana that had been burned out on single phase.

"One week later the same motor came back, again burned out on single phase.

"We investigated and found that the motor was used on the refrigeration compressor and that starting currents the retrigeration compressor and that starting currents were causing the 100 amp, 250 volt renewable fuses protecting the circuit to blow. When one of them blew

"The thermals in the statter were oversize and so the it single phased the motor.

motor burned up.

"100 amp. FUSETRON dual-element fuses were installed in place of the ordinary fuses and the thermals changed

"The thermals have so far never had to operate because the FUSETRON dual-element fuses stopped the to the proper size. pecause the FUSETKON qual-element tuses stopped the useless blows on the starting current. This automatically stopped the single phasing that had previously caused the motor burgers." the motor burnouts.

FUSES GIVE 10-POINT PROTECTION

TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION



- Fuseiron fuses have high interrupting capacity. Tests conducted by the Electrical Testing Laborateries of New York City in Dacember 1947 showed that on a 240 voir 60 cycle 3 phose, 4 wire circuit set to deliver 50,000 amperers, 20, 60, 100, 200, 400 and 600 ampere 230 voir Fuseiron fuses and every test cleared the circuit without belighing flame and with comparatively little noise.
- *Protect against short-circuits.
- 2 Protect against needless blows caused by harmless overlands.
- 3 Protect against needless blows caused by excessive heating losser resistance results in much cooler operation.
- 4 Provide thermal protection for panels and switches against damage from heating due to poor
- 5 Protect motors against burnout from averloading.
- to single phasing.
- 7 Give DOUBLE burnout pretection to large motors - without extra cast.
- 8 Make pretection of small motors simple and inexpensive.
- 9 Protect against waste of space and money - permit use of proper size switches and panels.
- 10 Protect cells, transformers and selenoids against burnout.

FusetroneFuses

Give All-Purpose Protection

because . . .

The fuse link element opens on short-circuit — the thermal cutout element protects on overloads — the result, a fuse with tremendous time-lag and much less electrical resistance.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to the same dimensions as ordinary fuses — fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

Don't Risk Losses

One needless shutdown
One lost motor
One destroyed switch

One destroyed switch or panel

may cost you far more than replacing every ordinary fuse with a FUSETRON dualelement fuse

> Bussmann Mfg. Co., University at Jefferson St. Louis 7, Ma. (Division McGraw Electric Co.)

Please send me complete facts about FUSETRON Dual-Element FUSES.

Title

Company

company

Address...... City & Zone

State

MAIL THE COUPON NOW

for complete information about Fusetron Fuses and their 10-point all-purpose protection

LOW COST

AT SPENCER-KEILOGG CO., Edgewater, N. J.

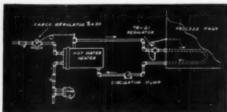


The hot water supply tank is controlled by the Sarco 2430 Temperature Control



Insurance

WITH SARCO
TEMPERATURE CONTROL



The edible oils processed in this plant discolor or scorch only a few degrees above their melting points which range from 77° on cocoanut oil to 105° for soy bean oil. How to protect the several hundred thousand dollars worth of oils in these eight tanks, all requiring different temperatures, was the problem.

Sarco engineers studied the job and recommended hot water as the heating medium instead of steam. By keeping the heating coil surface just hot enough, but not too hot, scorching the oil is prevented but output maintained. Each tank is controlled by a TR-21 regulating the hot water flow and a 2430 controls the hot water supply temperature.

RESULTS: What was a constant worry to both management and the operators is now a 24 hour security. There is no possibility of discoloring because of too much heat, nor of caking because temperatures are too low. The human element is eliminated as a source of error — and of course, the tanks use less heat.

FOR YOUR TANKS: There are many combinations of Sarco Steam Traps and Temperature Controls for open and closed tanks, indoors or out. It costs nothing to find out what this kind of insurance would cost.



TR-21
TEMPERATURE
REGULATOR

Each of the eight tanks is individually controlled by a Sarca TR-21



SARCO PIPE-LINE STRAINERS

Surce self-cleaning pipe line strainers are placed ahead of each control

301

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Represented in Principal Cities
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SARCO CANADA, LTD., TORONTO 8, ONTARIO

IMPROVES PRODUCT QUALITY AND OUTPUT

Here's How

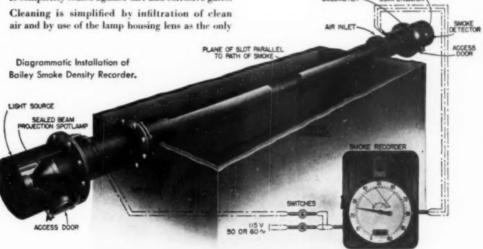


★ One of your first steps in erasing these troubles which result from excessive smoke, should be the installation of a Bailey Smoke Density Recorder. This 24-hour recorder is not an ordinary photo-cell instrument. Instead it detects smoke density by a Bolometer which is simply a sturdy tungsten filament and a parabolic mirror, mounted in a standard sealed beam automobile head lamp housing.

In using this simple, unique smoke detector, you do not have to provide cooling devices since the Bolometer is not harmed by high ambient temperatures. It is completely sealed against dirt and corrosive gases. window between the Bolometer and the gas passage.

It's easy to secure and maintain alignment of the sealed beam light source with the Bolometer since they are mounted at opposite ends of a slotted pipe which extends across the smoke passage.

For complete information on how you can profitably use this unique instrument to erase your smoke troubles, ask for Bulletin 211, "Bailey Smoke Density Recorder",



BAILEY METER COMPANY 1028 IVANHOE ROAD, CLEVELAND 10, OHIO - BRANCH OFFICES IN PRINCIPAL CITIES

let Bailey Smoke Density Recorders Watch Your Stacks

There's a C-E Stoker that meets your needs exactly.

There is no such thing as an "all purpose" stoker. Each type has advantages that are fully realized only when matched with coals of definite characteristics under well-defined operating conditions.

The importance of getting the right stoker is readily seen when you consider that the price you pay for it is only a down payment on the continuing cost incident to steam generation. Why? Because the cost of fuel burned every year throughout the useful life of the equipment far exceeds the original purchase price of the stoker. And, at today's coal prices this fact is of paramount interest to you.

Although the complete line of C-E stokers includes seven basic designs, one of the three types shown on the opposite page will prove to be most suitable in 4 out of 5 installations. Each of these stokers represents an outstanding value in its respective field. Each reflects the practical knowledge of fuel and operating conditions Combustion has gained through 65 years experience in stoker design and application . . . with more than 20,000 installations above residence size,

You can assure yourself of top stoker performance by coming to C-E — stoker headquarters — the next time you are in the market. Since C-E engineers have at their disposal every type of stoker equipment they can afford to be completely impartial in recommending the installation which fits your needs exactly.

B-408

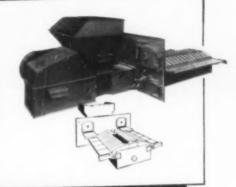
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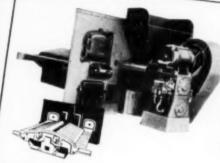
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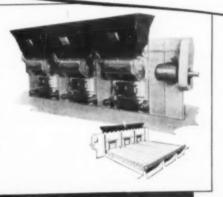
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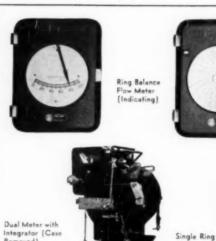
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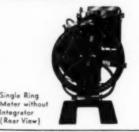




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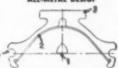
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You can "dial" the exact uniform heat you need to fit the job in infrared drying, baking, preheating, curing, dehydrating and similar applications when you use CHROMALOX Electric Radiant Heaters. Compact CHROMALOX Units operate equally well in low and high ambient temperatures, give glareless radiation in efficiently absorbed longer-wave lengths. Easy to install without expensive converting or cooling equipment. All-metal construction for long service.

Only Chromalox Radiant Heaters offer these features

ALL-METAL DESIGN



- 1. Inconel-sheathed Chromelex triangular heating element.
- 2. Highly polished, non-oxidizing reflector.
- 3. Rigid, extruded metal housing
- 4. Interlocking connector for assembling banks of heaters.

QUICK, EASY INSTALLATION



Clamps and Interlecking jo simplify assembly of units evens, banks, tunnels, etc.

VERSATILE APPLICATION



Cross-section views of a few of the many even designs possible with Chromolex Radiant Heaters.

For more Know-How Send for complete Application File

It shows you how many others are seving time, and increasing production with Chromolox Radiant Heaters.

EDWIN L. WIEGAND CO. 7543 Thomas Boulevard Pittsburgh 8, Pa.

Yes . . . send me the application flie on Chromalox Radiant Heaters

Company

Junianian,

CHROMALOX Radiant Heaters

frouble-free All-metal unit withstands shock, vibration, dust, blows and rough handling. Not affected by splashed liquids; nothing to shotter.

flexible heaf Precise temperatures at the turn of a dial, easily regulated for changed working requirements. Ovens can be zoned for stepped-down heat.

color-blind Chromatox Redient Heat ignores color variations; longer-wave length infrared is absorbed equally by all colors, textures, surfaces.

Uniform heating Light, dark or multicolored work may be processed simultaneously. Proper heater positioning assures an even blanket of heat without het-spots.

CHROMALOX

Electric heat for modern industry

C. B. Rogers, 1989 Passbrew N. N. E. Atlanta Ga J. R. Ward Ch. 2711 Commune N. D. Has I. Tenna; SUZ M. S. M. Bildz. Hearton Z. Tenna; 1811 Leutsians R., New Orleass 15, La; 1510 B. Boston No., Tokas S. Oxia; W. B. Phillips, P. O. 602 2551, G. W. B. Phillips, Jr. 3123 Lamb Are, Stechessed Z. Va.

10-48

These Sprague on the spot Power Factor Capacitors look like the perfect answer to our power problem. Check it!

HOW SPRAGUE CAPACITORS Save You Money!

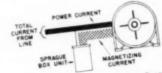
Whether you buy your power from a public utility company or produce it yourself, low power factor represents needless, moneywasting inefficiency.

Install Sprague Power Factor Capacitors right at the source of waste, and you'll be providing in effect a local generator which supplies-at low cost-the non-productive magnetizing current required by the load. Savings are often extensive enough to repay the cost of the installation in a year's time.

For an estimate on how much you can save by correcting power factor the efficient way, call in a Sprague representative. You'll be under no obligation. Or, write for our free booklet of cost-saving suggestions, Catalog 50B, today.



MAGNETIZING CURRENT This induction motor is operating under partially loaded conditions without Power Factor Correction. The feeder line must supply BOTH magnetizing (reactive) and power circuits.



Here's the result of installing a Sprague Capaciter to supply the magnetizing current required. Total requirement is reduced to power current only, thus either reducing power cost or permitting the use of more electrical equipment on the same circuit

SPRAGUE ELECTRIC COMPANY

PIONEERS DEVELOPMENT ELECTRONIC ELECTRIC AND

00F06 5 70

ALL FOR ONE ...

but <u>not</u> one for all jobs!



All of these B&W Refractories are designed for one job . . . to give you the longest possible boiler furnace service.

BUT NO ONE refractory can meet all furnace conditions. That's why B&W has developed this complete line of cost-cutting refractories to solve every furnace problem.

Whether your boiler produces 10,000 or 1,000,000 lbs. of steam per hour, you can be sure of getting expert refractory recommendations from your B&W Refractories representative. He can show you how to decrease costs and increase furnace life with the proper B&W Refractory for your application. Drop us a postal card to obtain the name of your nearest B&W Refractories Engineer.



HEAVY FIREBRICK -

For oil fired furnaces with flame impringement or spalling or slagging conditions, either B&W 80 or Junior Firebrick can be used. 80's assure uninterrupted service at extremely high ratings. Juniors are recommended where load bearing and temperature requirements are less severe, but too severe for the best grades of fire-clay brick.

INSULATING FIREBRICK -

B&W Insulating Firebrick have the lightest weight and lowest heat conductivity of any insulating firebrick in their class. They store and conduct less heat—withstand direct exposure to furnace gases. Available in six types for temperatures from 1600 F to 2900 F.

PLASTICS -

Used widely for repairs and for forming special shapes in place, B&W Plastic Moldable and B&W Plastic Chrome Ore offer long life under severe conditions. Plastic Moldable is suitable for use in the great majority of furnaces. It withstands temperatures up to 3000 F. Plastic Chrome Ore is ideally suited for severe slagging conditions.

CASTABLES -

In furnaces that require the high resistance of chrome to chemical attack and where speed of installation is important, B&W offers Kromecost for temperatures up to 3100 F and Hydrochrome for temperatures up to 2800 F.

For burner openings, door linings, walls, roofs and arches, B&W Kaccast possesses unusual volume stability and resists spalling. It easily withstands temperatures up to 3000 F.

B&W Bafile Mixes are excellent castables for the construction of monolithic beiler baffles, door linings and other general uses. They are smooth and flow easily, have high strength in small sections. Widely used to withstand temperatures as high as 2600 F.

B&W Insulating Concrete Mixes combine refractoriness, light weight and low heat conductivity with the ability to be poured like ordinary concrete. For temperatures up to 2200 F.

MORTARS -

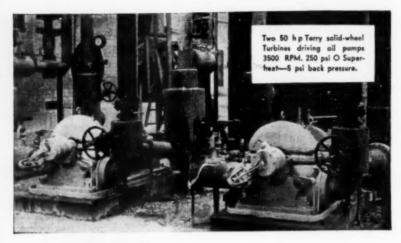
B&W Mortars—Selecting the right mortar is vitally important to long refractory life. B&W Mortars pay for themselves by saving time in application and by satisfactorily performing their jobs under the designed furnace conditions.



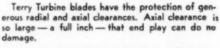
8&W REFRACTORIES PRODUCTS—8&W 80 Firebrick * 8&W Junior Firebrick * 8&W 80 Glass Tank Blacks * 8&W Insulating Firebrick * 8&W 80 Glass Tank Blacks * 8&W Insulating Firebrick * 8&W RODUCTS—Stationary & Marine Boilers and Component Equipment ...

Chemical Recovery Units ... Seamless & Welded Tubes ... Pulverizers ... Fuel Burning Equipment ... Pressure Vessels ... Allay Castings

III RIRIY



LARGE BLADE CLEARANCES GIVE ADDED DEPENDABILITY



Projecting rims at both sides of the wheel give further protection to the rotor buckets. Should clearance become reduced, these rims will take rubbing without damage to the blades.

This construction also makes frequent inspection of thrust bearings unnecessary.

A request on your business letterhead will bring you Terry Bulletin S-116 giving detailed information about these features and other Terry Turbine advantages.

If you have a specific turbine drive job in mind, our district Terry representative will be glad to discuss it with you.

T-1174



THE TERRY STEAM
TURBINE COMPANY
TERRY SQUARE, HARTFORD, CONN.



- production line?

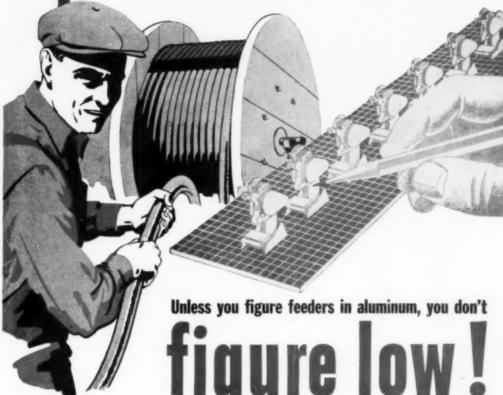


Figure your feeders both ways—in aluminum as well as copper. Prove to yourself that insulated aluminum can give you equivalent current-carrying capacity yet cost substantially less.

Aluminum can go in faster, too, because its weight is much less than

For names of manufacturers, and a copy of "Questions and Answers about Insulated Aluminum Conductors", call your nearby Alcoa sales office.

Or write ALUMINUM COMPANY OF AMERICA, 1780H Gulf Building, Pittsburgh 19, Pennsylvania.



Aluminum Conductors



of ALCOA 🖾 ALUMINUM are made by leading manufacturers



organization has not been a matter of weeks or months; it has taken years.

Beginning before the war and finishing in these first post-war years we, at Bunting, know we have the finest Distributor organization in our history.

These Distributors have, instantly available for you, Bunting Standard Stock Bearings and Bunting

Bars of Cast Bearing Bronze. The leading Distributor in your community is, almost certainly, the Bunting

Distributor. The Bunting Brass & Bronze Company,

Toledo 9, Ohio. Branches in Principal Cities.



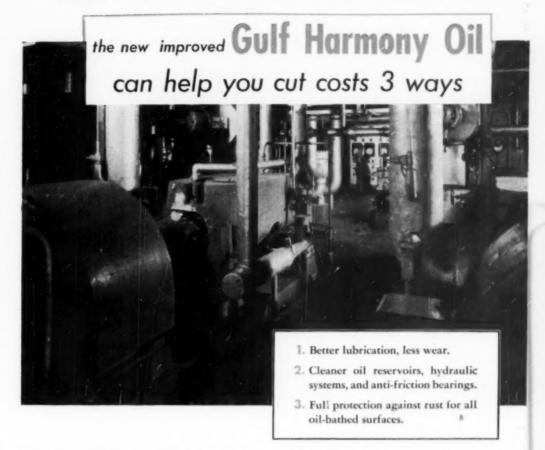
BRONZE BEARINGS

PRECISION BRONZE BARS

BUSHINGS

75

For pumps, compressors, and other oil-lubricated auxiliary equipment



The new improved Gulf Harmony Oil provides the kind of protection that means lower maintenance costs and freedom from lubrication troubles. Users report that it is the best lubricant they have ever used for pumps, compressors, blowers, and other oil-lubricated plant equipment. They also report excellent performance in hydraulic applications.

Gulf Harmony Oil is enriched with a remarkable new oxidation stabilizer—another important Gulf Research development. This additive improves the already outstanding oxidation stability of Gulf Harmony Oil—gives it exceptional resistance to sludging. In oil lubricated bearings it far outlasts competitive oils.

Gulf Harmony Oil has been fortified to provide an even more effective rust preventive film. Now you can be sure of full protection against rust for all oil-bathed surfaces. It is particularly effective for ball and roller bearings operating under wet conditions. And it separates readily from water.

This outstanding oil provides more effective protection for bearings, gear units, hydraulic mechanisms and compressor cylinders. Available in a wide range of viscosities.

For more complete information on Gulf Harmony Oil, call in a Gulf Lubrication Engineer today. Write, wire, or phone:

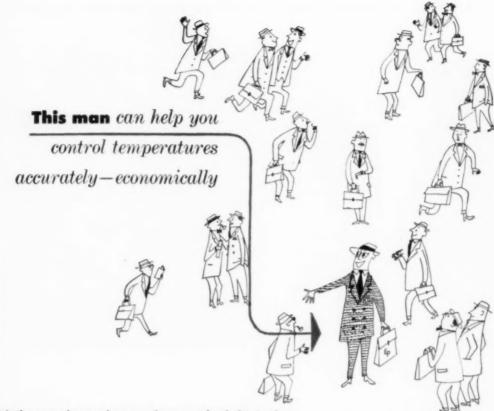


Gulf Oil Corporation · Gulf Refining Company

GULF BUILDING, PITTSBURGH, PA.

Sales Offices - Warehouses

Located in principal cities and towns throughout Gulfs marketing territory



He's the man who can show you the proper insulation to give maximum heat and power for each fuel dollar expended

An Eagle-Picher Industrial Insulation distributor or representative can help you reduce operating expenses because he has available a wide line of insulation products—for high and low temperatures—scientifically designed for maximum thermal efficiency, and practical application. Why not let him give you more information about some of the products listed here?

These Eagle-Picher products can save you money . . . power . . . time
Insulating Felts • Supertemp Blocks • Blankets • Loose Wool

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Finishing Cements • Insulating Cements • Fireproofing Cement
Distanceous Earth Blocks

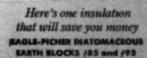


THE EAGLE-PICHER COMPANY

General Offices: Cincinnati (1), Ohio

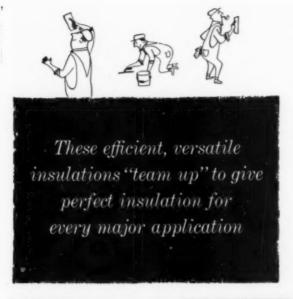
Insulation products of efficient mineral wool – for a full range of high and low temperatures. Technical data on request.

Since 1843





A highly efficient, rigid-type insulating material composed almost entirely of pure, lightweight, Eagle-Picher Diatomaceous Earth. High physical strength enables these blocks to stand up well under the handling and usage normally encountered in installation. Adaptable to virtually all types of heated equipment. Can be cut with a knife or saw to fit irregular shapes. DE-85 Blocks for temperatures to 1300° F. DE-85 Blocks for temperatures to 2000° F.



You can't beat the teamwork of Eagle-Picher Super "66" Insulating Cement, Eagle-Picher Insulating Blocks (Supertemp Blocks, Diatomaceous Earth Blocks No. 85 for temperatures up to 1300° F., and Diatomaceous Earth Blocks No. 95 for temperatures up to 2000° F.). They work effectively to give your equipment highest possible thermal efficiency... cut operating costs by saving the maximum amount of fuel . . . and help to provide perfect, precise control over temperatures.



EAGLE-PICHER SUPER "66" INSULATING CEMENT

Super "66" is all-purpose, rust-inhibitive, extremely adhesive insulating cement. "Springy ball" pellets don't collapse after application... give great coverage, retain their thermal efficiency. 100 lbs. covers 65 sq. ft.—1 inch thick. Easily applied with trowel, over flat and irregular surfaces. Efficient for temperatures up to 1800° F. Reclaimable when used on equipment whose temperatures do not exceed 1200° F.



EAGLE-PICHER SUPERTEMP BLOCKS

Eagle-Picher Supertemp Blocks are lightweight (approximately 16 lbs. per cu. ft.). Can be cut easily with knife or saw to fit off-shaped areas . . . they fit snugly over minor irregularities. They're strong and have high refractory value. Withstand temperatures up to 1700° F. Conductivity at 512° F. approximately 0.43 . . . all standard sizes, from 3°x18° to 12°x36° in thicknesses from 1° to 4°.



EAGLE-PICHER INSULSEAL

A tough, weatherproof, protective coating for insulation. For temperatures up to 450°F. Applied as a plastic, its smooth troweling qualities assure uniform coverage, proper thickness. It protects insulation from air infiltration, fumes, rain, snow, vibration, punctures, and withstands severe service, indoors or out. Dries to a smooth, rich black, has a neat appearance on hot or cold surfaces... may be washed or painted.

Be sure to visit Eagle-Picher's booths Nos. 61 and 62 at the 49th National Power Show, St. Louis, Missouri, August 15, 16, 17, 18, 19.

THE EAGLE-PICHER COMPANY General Offices: Cincinnati (1), Ohio

Insulating Felts • Supertemp Blocks • Blankets • Loose Wool • Pipe Covering Stalastic • Insulseal • Insulstic • Swetchek • Finishing Cements Insulating Cements • Fireproofing Cement • Diatomaceous Earth Blocks





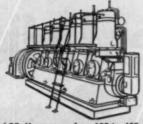
For Melting Non-ferrous Metals In Amy Furnace -- -- NORTON Refractory Cements

For melting all non-ferrous metals — in high frequency and induction furnaces, pit furnaces, direct arc type rocking furnaces — Norton Company offers a complete line of high temperature cements and prefired shapes. Fused magnesia cements for lining Ajax-Northrup high frequency furnaces melting nickel-chromium alloys; silicon carbide mixtures for ramming into oil or gas fired reverberatory and pit furnaces melting aluminum, copper and zinc; fused alumina cements for lining burner tunnels in gas or oil fired billet heating, heat treating and annealing furnaces; fused magnesia cement for rammed linings in Ajax-Wyatt low frequency vertical ring induction furnaces melting high copper alloys, and cupronickel, nickel-silver and cadmium-bronze alloys.

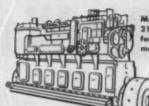


NORTON COMPANY WORGESTER 6, MASSACHUSETTS Model 45B: 51/4 horsepower engine for stationary and marine service.

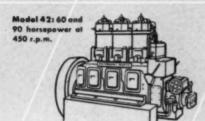


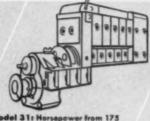


Model 32: Horsepower from 120 to 450. For slow-speed heavy-duty service.

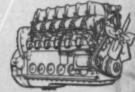


Model 37: 500 to 2125 horsepower for direct drive marine service.

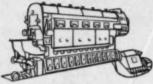




Model 31: Horsepower from 175 to 500; with 2 to 1 reduction gears optional for marine service.



Model 49: Marine Engine: Alse available for stationary or portable service.
20 to 150 hp.



Model 38 Opposed-Piston Engine: Horsepower from 960 to 1920 with 2 to 1 reduction gear for marine service.



When it comes to Diesel Power...

From 3.5 hp. to 3500 hp.

Low-cost, efficient power for all marine services . . . modern, dependable power for newest, fastest road locomotives . . . economical power for largest to smallest municipal and industrial plants . . . Fairbanks-Morse is the proved source for the full range of diesel applications. For skilled assistance and impartial recommendation for the diesel for your specific service, write Fairbanks, Morse & Co., Chicago 5, Ill.

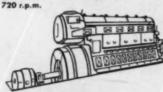


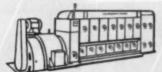
FAIRBANKS-MORSE,

a name worth remembering

DIESEL LOCOMOTIVES AND ENGINES - ELECTRICAL MACHINERY - PUMPS - SCALES HOME WATER SERVICE AND REATING EQUIPMENT - RAIL CARS - FARM MACHINERY

Model 38 Opposed-Piston Engine: 960 to 1920 horsepower at



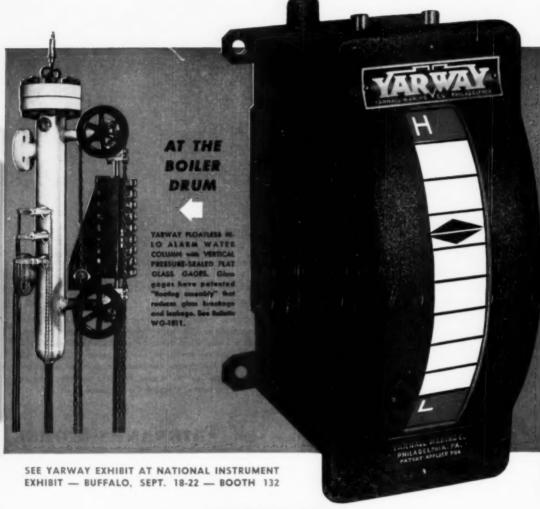


Model 31: Diesel generating set with kw. ratings from 118 to 360. Marine and stationary—Dual Fuel available in larger sizes.



Model 31: 2100 to 3500 horsepower diesel or duel fuel engine for heavy-duty stationary service.

Boiler Water Indication





ON THE LEVEL with a Yarway System

It's accurate! It's where you can see it!

These two most important needs for boiler water level indication are assured with a Yarway system.

Yarway indicating equipment is accurate because it is operated directly by the boiler water itself. Yarway Weight-operated Hi-Lo Alarm Water Columns with either Sesure Inclined or Flat Glass Vertical Gages take care of the job at the boiler drum. On the instrument panel or other desired location, Yarway Remote Liquid Level Indicators bring over-

bead gage readings down to convenient, easy eye-level vision. By use of a Control Unit on the indicator, additional HI-Lo light or sound alarms can be located at any place in the plant.

The Yarway HI-LO-GRAPH, a panelmounted recording indicator, gives a 24-hour record of boller water levels.

Yarway engineers will gladly show you how the Yarway Boiler Water Indicating Systems increases power plant safety and efficiency.

For the full story on Yarway Indicators, write for a free copy of Yarway Bulletin WG-1822.

YARNALL-WARING COMPANY, Home Office: 116 Mermaid Ave., Philadelphia 18, Pa.

ON THE INSTRUMENT PANEL

YARWAY SEMOTE SCUID
SEVEL PROCEATOR, operand
directly by the belter vistor
shelf, by the presence differential letween a constent head and the verying
seed in the belter dress, beltesting
sectionism to rever under processes—an
shelfine boates. See Selectin WG-1822.

TARWAY PE-LO-GRAPH MI-CORDER provides not only antest indication but also 24laser recording of ballor vector ferein. See Eutletin WO-1839.



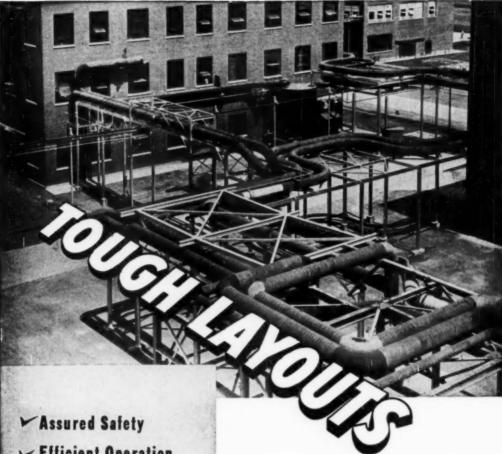
ANYWHERE IN THE PLANT

YARWAY REMOTE NI-LO ALARM SIGNALS, Reins or horse. Operated by Control Unit attached to Remote Liquid Level Indicator or Recorder. Any number can be installed, at any desired facotions throughout the plant. See Bulletin WG-1822.









- Efficient Operation
- ✓ Minimum Fuel Costs
- V Low Maintenance
- Long, Trouble-Free Life

MADE SIMPLE BY NAVCO

The high degree of skill acquired by Navco Engineers from long experience in solving unusual Piping problems is your quarantee of an accurate and workmanlike Piping System.

Consult Navce for your next Piping Job



NATIONAL VALVE & MANUFACTURING COMPANY - PITTSBURGH, PA

NEW YORK . CHICAGO . CLEVELAND . BOSTON . ATLANTA . TULSA . BUFFALD . CINCINNATI

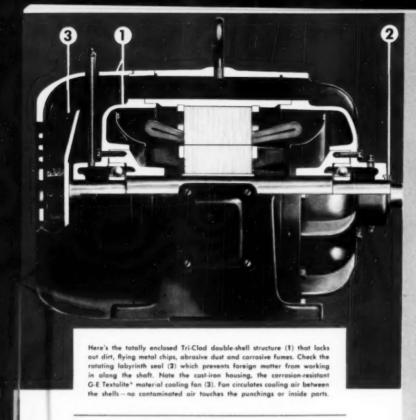
YOU CAN'T BEAT A

TRI CLAD MOTOR FOR

CORROSION RESISTANCE

GENERAL & ELECTRIC

Here's



You can't beat TRI CLAD motors

for corrosion resistance

Acid fumes, alkali dust, dye-house vapors, tropical weather — you name *your* motor "poison." You just can't beat Tri-Clad cast-iron construction for corrosion resistance.

Rolling up 6 billion hours of service on all kinds of jobs, more than 1,876,000 Tri-Clad motors tell the eye-opening story of cast-iron motor structure. You get an inherent damping action that minimizes noise and damaging vibration. You get rigidity that makes for permanent shaft alignment. (Try bolting a Tri-Clad motor to an uneven surface—the bolt will snap before you can twist the rigid frame out of line.) You get extra protection against jarring blows and rough handling. You get resistance to rust and corrosion that is not approached by any other metal used for standard motor construction today.

WANT MOTORS THAT STAY ON THE JOB ANWYHERE? There's a stock of Tri-Clad motors near you, in nearly all types and ratings, ready for immediate shipment. Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

*Reg. U. S. Pot. OR.

"Reg. U. S. Pat. Off. (standard on popular sizes)

GENERAL 🎉 ELECTRIC

TRI CLAD EXTRA PROTECTION



O-E especitor maters for use on fens blowers, pumps and compressors with single-phase power. From 4 to 5 hp



G-E Type ACA induction motors for edjustable speeds—provide speed ranger from 3-1 to 20-1, From 3 to 75 hp.



O-E open (dripproof) induction motors for constant-load, constant-



G-E totally anclosed motors for outdoor operation, in abrasive dusts, or corresive fames. From 1 to 1000 kp.



Look for this EXTRA on the motor you buy!

Newly Designed

Walworth

Valves

to combat

corrosion



Walworth 150-pound Stainless Steel Gate Valve available in sizes 1/2 to 3-inch, screwed; 1/2 to 12-inch, flanged.

- ENGINEERED AND TESTED FOR TOUGH . . . HARD SERVICE

Walworth offers a comprehensive line of valves made of several cast stainless steels and special alloys for piping services where corrosion is a factor. These valves are available in Gate, Globe, Angle, Check, and Lubricated Plug types.

Gate, Globe and Angle Valves have outside screw and yoke construction, thus keeping the stem threads out of contact with the corrosive material in the line. They also have a two-piece bolted gland with ball-type gland follower to prevent binding the stem when packing bolts are tightened. Gland eve-bolts can be conveniently swung out of the way without danger of loss when the gland is lifted for repacking.

Gate Valves have taper seats with a unit consisting of two flat faced discs supported by a carrier on the end of the stem. The discs are of a proven ball-and-socket type. They are free to rotate and adjust themselves to the body seat angles, assuring tight seating with no possibility of sticking in any position.

For further information about Walworth's full line of corrosion-resistant valves, see your Walworth distributor.



Walworth 150-pound Stainless Steel Globe Valve .

able in sizes 1/2 to 3-inch, screwed; 1/2 to 6-inch, flanged.

Sectional view of Walworth 300-pound Stainless Steel Gate Valve . . . available in sizes 2 to 6-inch, flanged.

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

CENTERS THROUGHOUT THE PRINCIPAL DISTRIBUTORS WORLD

Made of Stainless Steel

Monel · Nickel

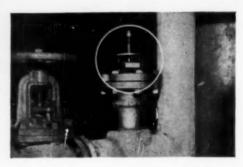
Acid-resisting Bronze

Ni-resist

Protect Your Closed Process Vessels For As Little As \$5.00



With The HONEYWELL VACUUM BREAKER



Vacuum breaker on steam line feeding a stripping column. If steam demand from other units is enough to create a vacuum, breaker opens, preventing collapse of stripper.

Sometimes the evacuation of fluid from closed vessels is so rapid that collapse is caused by the pressure differential between atmosphere and inside vacuum. Inserted at the proper place in the system, the Honeywell Vacuum Breaker will prevent such costly trouble... by permitting atmospheric air to enter before damage is done. That's mighty economical insurance at a price of less than \$5.00 for the 1" size.

The Honeywell Vacuum Breaker is rugged and dependable. It will not clog, requires a minimum of maintenance and is easily adjusted to the desired vacuum setting. It is exceptionally compact . . . the 3'' size is but $6\frac{1}{2}$ high.

Standard sizes, from $\frac{1}{2}$ to 3 inches, are stocked . . . they are spring loaded, are made of bronze and are furnished with screwed connections. Larger sizes, up to 8 inches, may be ordered . . . they are weight loaded, are made of cast iron and are furnished with flanged connections.

Call in your local Honeywell engineer for a discussion of further details . . . and ask him about such other Honeywell process specialties as Transfer Valves, Hi-Lift Hand Valves and the Honeywell Space-Saving Bypass. MINNEAPOLIS-HONEYWELL REGULATOR Co., Industrial Division, 1902 Windrim Avenue, Phila. 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

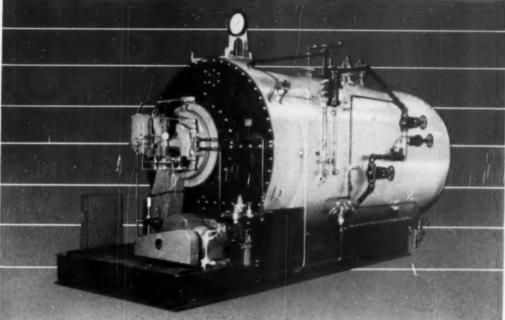


VALVE PRODUCTS

A NATION-WIDE NETWORK OF FACTORY-AUTHORIZED SERVICE

. . . Another Reason Why You Get A
Greater Return From Your Investment In A
Cleaver-Brooks Steam Boiler





Nothing is more important than dependable operation of your steam boiler — vital to such operation is proper maintenance and service.

Cleaver-Brooks steam boiler service facilities are national — through factory-trained and authorized service organizations. Service begins with starting of your new boiler. It is placed in operation and fully tested under load by Cleaver-Brooks service-representatives. Your operators are trained in operation, care and maintenance.

Burn the available fuel in your area — gas or oil — with equal efficiency: Through their high heat transfer Cleaver-

Brooks boilers operate at a guaranteed efficiency of 80% from full load down to 30% of rating, burning gas, oil, or combination gas and oil. No high or costly stacks (a simple roof vent carries off combustion gases)—no special foundations needed. Fit low head-room areas—provide quick steaming, flexible operation to meet fluctuating loads—eliminate ash handling. Cleaver-Brooks boilers fully meet all codes—available in sizes 15 to 500 H.P.—15 to 200 P.S.I. Write for new, just published catalog.

CLEAVER-BROOKS COMPANY
365 East Keefe Avenue, Milwaukee 12, Wisconsin



NEW — The Cleaver-Brooks steam boiler Catalog—interesting—informative—beautifully illustrated, Write—on your business letterhead for your copy.

Cleaver-Brooks

Unless you have used Standard Oil Lubricants throughout your plant, you'll never know the difference the right kind of lubrication can make. There is available to you in Standard Oil Lubricants the knowledge accumulated from

you'll never know

more than sixty years of lubrication service to southern industry, backed by the largest combined facilities for testing and research of petroleum

products in the world. ... If there is any question in your mind regarding the proper lubricant for any specific need, a Standard Oil lubrication engineer will survey your plant and blueprint your lubrication requirements. Why not take advantage of this experienced service today?



STANDARD OIL

COMPANY INCORPORATED IN KENTUCKY

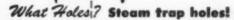
THIS will plug the holes in your boiler!



33 1/3% REDUCTION IN ANNUAL COAL BILL after installing Armstrong traps on cooking vats — a Midwestern lumber company.



\$59.62 FUEL SAVINGS PER MONTH after unit trapping a Milwaukee drycleaning plant with only 14 small sized Armstrong traps.



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- Valve and seat of chrome steel heat-treated, ground and lapped. Will not wire draw or pound out.
- 2. All other working parts of 18-8 stainless steel for long wear and corrosion resistance.
- Buckets have generous buoyancy margin of safety to prevent prime loss.
- Dirt can't settle on valve or seat to hold orifice open.
- 5. Nothing to stick or bind to prevent valve from closing |
- Backed by 40 years of experience in building inverted bucket traps.

Get the full story from your Armstrong distributor or write for a copy of the ARMSTRONG STEAM TRAP BOOK—complete data on operation, selection, installation and maintenance of traps. Free on request.





ARMSTRONG
806 Maple Street

MACHINE WORKS

• Three Rivers, Michigan

ISTRONG STEAM TRAPS

Avoid "DOWN-TIME" for Maintenance-Standardi on the POWE



Fig. 19084 W. E.—Class 900-pound Cast Steel Pressure Seal Globe Non-Return Valve with welding ends and apur gear operation. Its improved streamline design reduces pressure drop and turbulence to the m

tions. First, will it operate satisfactorily in the service in which it is to be used? Second, and of most importance, how much maintenance will it require? Because, every time maintenance becomes necessary, there's a two-fold cost. One, the cost of labor-and possibly parts-to put it back in working order. Two, the loss of production farther down the line.

When you buy a valve, ask yourself these two ques-

And, because Powell Engineers always have this in mind, every valve in the complete Powell Line* is designed and made to avoid, as far as possible, "DOWN-TIME" for maintenance.

That's why, through the years, Powell Valves have been noted for long, trouble-free performance-even under the most exacting service conditions.

check valves also available.

Fig. 1367-A—Small size, 1500-pound Steel Angle Lift Check Valve. Pres-sure Seal construction. "Y" type lift



Fig. 559 - 125-pound Iron Body Bronze Mounted Swing Check Valve with flanged ends, bolted flanged cap and regrindable, renewable bronze seat and di







Fig. 6003 W. E.-Class 600pound Cast Steel Gate Valve. Welding ends, outside screw rising stem, bolted flanged yoke, tapered solid wedge.

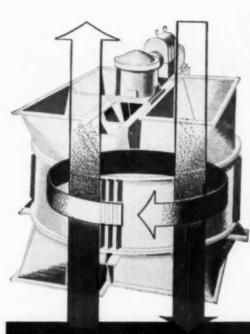


tive opening and closing.

*The Complete Powell Line includes Globe, Angle, "Y", Gate, Check, Non-return, Relief, and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-resistant metals and alloys.

Ask your nearest Distributor-or write direct

The WM. POWELL Co., 2525 Spring Grove Ave. P. O. Box 106, Station B. Cincinnati 22, Ohio DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES



this preheater
can save you money
whatever
your fuel



Ljungstrom AIR PREHEATER

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air. All fuels burn better with preheated combustion air, and it is a "must" for many of them, such as high moisture powdered coal. In addition, the continuous regenerative counterflow principle of Ljungstrom permits reliable operation at low exit gas temperature. This assures the greatest possible heat recovery . . . reduces the amount of fuel required.

The efficiency and reliability of the Ljungstrom air preheater is a matter of record in industrial and utility plants throughout the country. That is why every year a constantly increasing percentage of the installed boiler capacity is equipped with Ljungstrom air preheaters.

If you are planning a new installation, or modernizing your present one, our engineers will welcome the opportunity to show you how the Ljungstrom can raise the efficiency of your plant.

THE AIR PREHEATER

60 East 42nd Street, New York 17, N. Y.

CORPORATION

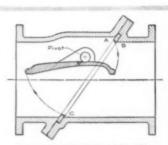
SOUTHERN POWER & INDUSTRY for AUGUST, 1950



You get truly cushioned closing with these tilting-disc check valves. There's no slamming. Instead, the disc rides smoothly on the flow, opens easily, closes quickly and quietly. Because of this effortless action, power costs are lower (when used on pump discharge lines) . . . maintenance costs are lower . . . operating expenses are saved in a dozen ways.

Available in either iron or steel. Write for bulletin with complete information.

The Chapman Valve Mfg. Co.



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

Timely Comments

Power of the South

"POWER OF THE SOUTH" shows many of the activities that are helping the Southeast to maintain industrial growth above the national average in recent years. This color motion picture has just been completed under the sponsorship

of Southern Company and its associated operating companies—the Georgia, Alabama, Gulf and Mississippi Power companies. The film brings into focus the sharp changes which have occurred in recent years in the economy of the states of Alabama, Florida, Georgia, and Mississippi.

C. B. McManus, president of the Southern Company and Georgia Power Company, says the movie will be shown to "everybody who will look at it all over the nation."

Broad in scope, the film pictures the change in agriculture from the one-crop system to the highly diversified farming of today, shows how various natural resources are being utilized, how industry has mushroomed in the region, and the beauties the Southeast has to attract tourists and vacationers.

Pointing to what the utilities are doing, Mr. Mc-Manus says the Southern Co.'s operating companies will spend \$500,000,000 for expansion and improvements to their systems during the next decade.

"Power of the South" will unquestionably become a vigorous sales influence, selling not only our own people but those from other areas as well on the growing advantages of this New Southland.

Instrument Show Scheduled for Houston, Texas

THE 1951 I.S.A. national exhibit and technical meeting will be held in September, 1951, at the Coliseum in Houston, Texas. This will be the first national Instrument

Society of America convention held west of the Mississippi and it is expected that this will be the largest technical symposium and exhibit ever held in Houston. William H. Fortney, instrument foreman at the Humble Oil & Refining Company's Bayton, Texas, refinery, is chairman for the committee handling arrangements.

On a national scale the following societies are cooperating on the convention plans: American Society of Mechanical Engineers, American Institute of Physics, American Institute of Electrical Engineers, Institute of Radio Engineers, National Telemetering Forum, and the Scientific Apparatus Makers Association.

Industrial Development in Oklahoma

OKLAHOMA'S drive for new industrial development scored a major triumph in June when ground was broken at Shawnee for the new \$1,500,000 television and radio tube manufactur-

ing plant of the Sylvania Electric Products, Inc. The new 50,000 sq ft plant will more than double Shawnee's industrial payroll and is expected to add \$1 million to Oklahoma's financial channels.

Negotiations for the plant started shortly after Oklahoma's famed eastern industrial tour three years ago, which was headed by Oscar Monrad, then head of the industrial development department of the Oklahoma City Chamber of Commerce. Mr. Monrad is now vice-president of the First National Bank and Trust Company of Oklahoma City and head of the Oklahoma Industrial Development Conference.

Bituminous Coal Utilization

ELECTRIC UTILITIES are using an increasing amount of bituminous coal to generate electric power, according to a report of the Federal Power Commission. In April, when use of electricity and

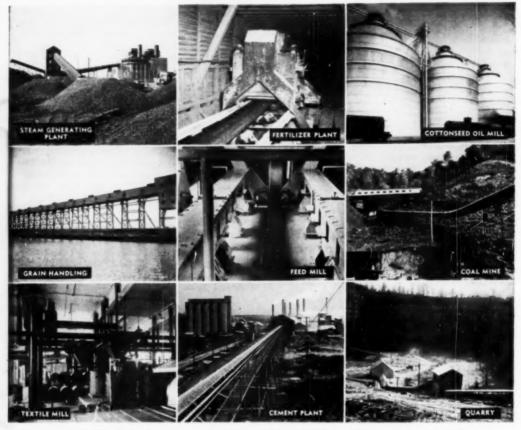
coal consumption normally show a sizeable drop, the country's power plants burned nearly seven million tons of coal. This was a considerable rise over the same month of last year. And it helped maintain a general upward trend for the last several months.

The Power Commission also reported that abundant coal is an increasingly efficient fuel. So far this year, all the nation's electric generating plants need, on the average, four per cent less coal than they did last year to produce the same amount of electricity. On the average it takes a little less than one and a fifth pounds of coal to generate one kilowatt hour of electricity.

But some plants, like the Potomac Electric Power Company in Washington do even better. In fact, Pepco's new plant is one of the most efficient in the United States. It needs only three-quarters of a pound of coal to generate a kilowatt hour of electricity.

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INDUSTRIAL DIVISION CONTINENTAL GIN COMPANY

ENGINEERS





Industry Speaks

Why Spend Money on Southern Research?

Abstracted from an address by DR. STEWART J, LLOYD at the Tenth Annual Meeting of the SOUTHERN ASSOCIATION OF SCIENCE AND INDUSTRY, INC., at Charleston, S. C. Dr. Lloyd, Dean of the University of Alabama, is a past president of the Association.

GRANTED that research raises the general standard of living, and that it must be pursued if we are to maintain our place in the world, why should we spend money on it here (South and Southwest), by establishing research institutes, by creating research divisions in our own businesses, and by making appropriations to our colleges and universities expressly for research?

Our large industries, U. S. Steel, DuPont, Cyanamid, Westinghouse, and General Electric, have enormous research establishments already in action in the North and East. There are research organizations like Arthur D. Little in Cambridge, Mass., the Mellon Institute in Pittsburgh, Batelle in Columbus, and Armour in Chicago, which are well equipped and well staffed, and will undertake work for us.

Why try to duplicate all this in the deep South? Why not send our problems up there to these older and experienced laboratories, and pay what is necessary? It will probably be less expensive than setting up our own place.

There are two valid answers to this legitimate question.

The first is that the standard of living in a district. which means usually the real income of the people, the industrial activity, the number of patents issued and the expenditures for research can be shown by actual figures to go hand in hand. Which comes first, the research expenditures, or the industrial activity need not concern us now; they do occur together. If we have our research, originating here, done in Pittsburgh or Detroit, the chances are that the results of it will also be located in those areas. This has happened already more than once with research paid for by southern companies. Henry Ford started his research on motor cars in Detroit, and the automobile industry has centered there ever since. Of course Detroit is a pretty good place for manufacturing anyway, but I doubt that the motor industry would have moved there had it started in Chattanooga or Atlanta.

We cannot expect to secure here in our territory the good results of pioneering research if we have it done somewhere else. There are more things to be discovered, more things to serve as starting points for new and useful industries than there ever has been before.

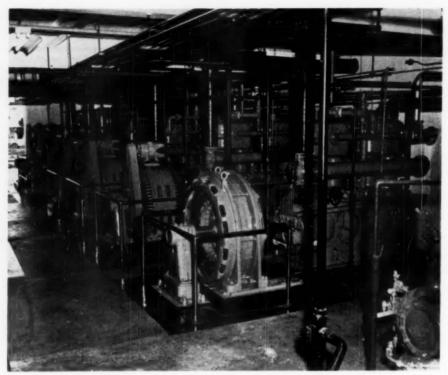
The second reason is that by neglecting research, or by having it done for us somewhere else, we shall be in effect, accepting as a permanent thing a "colonial" economy. We do not want to have our manufacturing done elsewhere, we don't want to have our children get their advanced education elsewhere, and there is every reason why our research work should not be done outside our area.

The presence of a research institute or a large private research organization has a distinct stimulating effect on the intellectual and business life of a community. It can see the difference in Birmingham since the founding of the Southern Research Institute, and Oak Ridge and the University of Chattanooga Institute have had no doubt a similar effect on their general area. These effects are hard to measure in dollars and cents, but they are none the less real.

Finally let me point out one feature of research that should appeal to us in these days when the political outlook is so black. Research in the natural sciences is essentially international, it recognizes neither color, nationality, religion, nor age. Mme Curie, a Polish Frenchwoman, Einstein, a German Jew, Rutherford, a New Zealander, Flaming, an English doctor, Fermi an Italian, Neils Bohr, a Dane, all have made fundamental discoveries.

Research in all countries save one is still free, that is, a man may work on what he prefers, and he may draw from his results the conclusions he thinks correct. This is not true in Russia today. Research is regimented, put into a straight jacket there. If your results do not agree with Marxian theory, you had better forget them, or you will lose your job, as Russian botanists have already discovered.

We are hardly in danger here yet of governmental regimentation of research, but it is something to be watched, and the determined effort to create a National Science Foundation at Washington is a step along that road. There are still some of us who believe in "rugged individualism".



BATTERY OF 4-CYLINDER COMPRESSORS ON HEAT PUMP SERVICE IN LAKE WALES, FLORIDA.

Heat Pumps Effect Saving in Florida Citrus Juice Concentrating Plant—

Compressors supply heat for evaporation as well as refrigeration for cooling

N February of 1948 the Florida Citrus Canners Cooperative started at Lake Wales a plant for concentrating fruit juices, working on a new principle which has proved highly successful and which promises wide application in many fields.

The process is remarkable because a refrigerating machine instead of a boiler is used to heat the citrus juice and drive off the excess water. The same refrigerating machine simultaneously cools and condenses the water vapor, under a strong vacuum. The heat balance in this closed cycle is very good, only 70 gallons of water being needed per minute to carry away extra heat, through a small supplementary condenser.

The juice from oranges, lemons, limes, or grapefruit is evaporated so quickly and at such a low temperature that the flavor is not modified, and the food and vitamin values are preserved. Fresh juice and pulp are added to the concen-

trate to reinforce the flavor; the product is then passed through continuous freezers, sealed in cans under a vacuum, hardened, and sold in frozen condition. The housewife, chef, nurse, or fountain operator adds three cans of water to one can of frozen juice; the water hastens the thawing and is itself cooled. Most people cannot tell the prepared juice from that of freshly harvested fruit. One orange in every nine grown is now processed by this or similar methods.

The success of this plant is based on nearly 20 years of work by J. L. Heid, now Director of Research and Development for the Cooperative. Dr. Heid worked in U. S. Government laboratories at Los Angeles and Winter Haven, Flori-

da, and along with others improved the methods of concentrating citrus juices at low pressures.

At this point Joseph A. Cross of Mojonnier Brothers Company, Chicago, was called in to develop an evaporating process which would provide for economical evaporation of water, using a low-temperature heating medium. An investigation indicated that the steam evaporating cycle commonly used had certain limitations. Following a thorough study of the subject. Mr. Cross suggested using both sides of the refrigeration cycle. A pilot plant proved successful, and was followed by the commercial installation now in use by the Florida Citrus Cooperative. The plant is a triumph of engineering skill. The system is covered by patent applications made by Mojonnier Bros. Co. Midwest Engineering and Equipment Co., Frick sales representatives at Chicago, installed the refrigerating equipment.

Operating Cycle

For a century, designers have been searching for a method of concentrating liquids in a closed vacuum cycle, the heat given off in the condenser to be used in boiling the incoming liquid. There is less than 2 per cent more heat in a pound of steam at 100F than at 60F. But at the condensing temperature of 60F, the volume of each pound of the vapor is 1208 cu ft. Any vapor pump handling such a volume in a commercial plant would lose far more than 2 per cent in friction. This and other charges have combined to make it cheaper to use live steam than the regenerative cycle in the past.

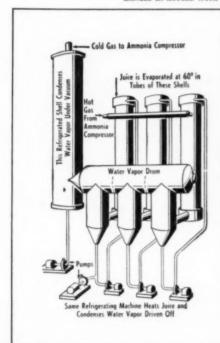
However, the high ratio of performance of a refrigerating system, from the standpoint of heat, adapts it perfectly to this service. It is easy for a refrigerating machine to handle from 3 to 5 times the heat-energy put into the motor driving it. Applied to shell-and-tube vessels for evaporating and condensing water from orange juice, this means we pump 2 pounds of ammonia gas with a total volume of 7.2 cu ft, instead of a pound of water vapor at 1208 cu ft.

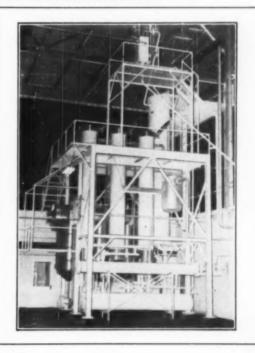
Concentration Process

The process, which is applied under strict chemical and bacteriological control, is as follows. Selected varieties of the fruit are picked when having the finest flavor and color, as well as sugar, acid, and vitamin content. After the fruit has been both sorted and washed twice, the juice is extracted by machinery and is strained to get rid of the seeds and membranes. It is then screened to separate the 10 per cent of juice sacks, called pulp. Most of the air is then taken out of the strained juice unter vacuum, and the liquid is piped to the top of the first evaporator

As shown in the photograph and diagram, there are three of these vertical shells, which contain tubes of stainless steel, in each unit. The heads and covers of the shells are also of stainless steel, as is the flash drum into which they drain. The three shells in the first unit are heated by the discharge gas, at 105F, from a 4-cylinder Frick ammonia compressor.

THE LO-TEMP EVAPORATOR IN USE AT LAKE WALES HAS THE BASIC DESIGN, SHOWN AT LEFT, AND IS ARRANGED IN ACCORD WITH THE INSTALLATION PHOTOGRAPHED AT RIGHT.





After flowing by gravity through the tubes of the first shell, the juice runs into a catch basin below the flash drum. Water vapor is released, while the liquid drops to a pump and is recirculated through the shell. In this first loop the juice remains 1.3 minutes; beginning with 8 to 13 per cent of soluble solids, it is concentrated to about 20 per cent.

As more juice is fed in, it overflows a partition in the flash drum and enters the second-stage evaporator, where in another 1.3 minutes the concentration is raised to 40 per cent. By the time the juice leaves the third evaporator, the soluble solids contents is approximately 60 per cent and the temperature of the juice, depending on the rate of feeding and the vacuum maintained, is between 50F and 70F.

The water vapor evaporated from the juice passes from the flash drum into the bottom of the condenser shell. Here ammonia, expanded at 45F, is in the tubes. A two-stage steam ejector, connected near the top of the shell. maintains a vacuum equivalent to 0.35 or 0.40 in. of mercury. Condensate, amounting to 4050 lb per hour, is removed by a Westco pump, with 3/4-hp motor. The suction gas passes through a surge drum or accumulator, into which the liquid ammonia is also fed by electrically controlled valves. The main ammonia suction goes direct to the same 4-cylinder compressor

which discharges into the three evaporators.

Part of the discharge gas is reduced to a liquid in the three shells, and the cooling is completed in a small horizontal shell-and-tube condenser, mounted above the ammonia receiver. The 70 gpm of water enters this condenser at 80F and goes out at 98F.

Freezing Process

Concentrated orange juice is pumped from the evaporator into an ammonia-jacketed mixing tank held under vacuum where enough fresh orange juice containing pulp is added to adjust the soluble solids to 42 per cent. As the tank fills, the temperature is lowered to about 25F. The orange juice is next run through a Votator, similar to a continuous ice cream freezer, made by the Girdler Corp. This freezes 35 per cent of the water in the product, to give a creamy slush at 16F.

The semi-frozen juice is sealed under vacuum in cans of three sizes: 6 ounces, 1 quart, and 1 gallon. Trays loaded with the cans are conveyed to the hardening tunnel which is kept at —30F by two direct-expansion air cooling units. They are later quickly packed in shipping cases in a room which is at ordinary temperature, before being returned to the storage room, maintained at —10F by two more Frick air cooling units.

The equipment originally installed continues producing 900

gallons of final product in a little less than seven hours. No trace of the sugar in the orange juice is found in the condensed vapor. The large compressor, equipped with a 300-hp motor running 327 rpm uses slightly less than 200 kw per hour. This figures out to 66 hp per 1000 lb of water evaporated. The cost of power per unit of evaporation with the ammonia system is considerably less than the cost of fuel used by the same Cooperative for a double-effect steam evaporator system in another plant.

The freezing and low-temperature storage work was first handled by four other Frick compressors: a 15 by 10 duplex coupled to a 9 by 9, a 6 by 6 and a 5 by 5. These machines each have two cylinders.

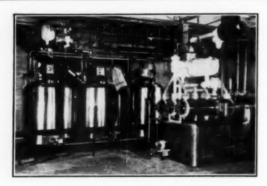
Plant Expanded

As additional evaporating units were added, the original five compressors were increased to fifteen. The motor load on the refrigerating machines has grown from 550 to 3180, making this one of the largest cooling systems in the frozen food field. In July of 1949 the plant was given the "Food Industries" award as the outstanding development of the year in food technology.

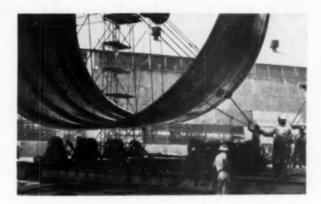
Six large 4-cylinder compressors are now used on heat-pump service alone. Two of these machines are of 14-in. bore and 12-in. stroke, each driven by an Ideal motor of 700 hp. Each delivers 725 tons of refrigeration. With a similar compressor at Florence Villa, Florida, these are among the heaviest ammonia compressor drives ever installed. A number of other Florida plants are now projected or building, to use the same principle.

Other Applications

The process is equally applicable to concentrating milk, tomato juice, many additional kinds of fruit juices, pharmaceuticals, liquid eggs, pectin solutions, sucrose juices, chemicals, etc. The evaporation temperature can be anywhere between 40 and 160 F. Little, if any, cooling water is necessary. The condensate is all recovered, hence the cycle can be used for distillation as well as concentration.



THESE COLD-WALL TANKS AND VOTATORS ARE IN-STALLED IN THE AUBURNDALE, FLORIDA CITRUS JUICE CONCENTRATING PLANT.



Turning Rolls Facilitate Welding of 31-ton Sections in Consolidated Western Steel's Orange, Texas Plant

Nine 300 ft sections of steel shell for the Baytown-Pasadena Highway Tunnel under the Houston Ship Channel, are scheduled for launching at the Consolidated Western Steel Company's mill at Orange Tayes by Cotober 1950

Orange Texas, by October, 1950.

Sections are joined by manual welding until a tunnel section 300 ft long is completed. A watertight bulkhead is placed at each end and 75 tons of steel reinforcing rods are stored in the bottom of the section for ballast. Each section is then towed from the Sabine River at Orange through the Gulf, to the jobsite about 125 miles away. Here they are sunk into an underwater canal previously dredged across the Houston Ship Channel.

Welding

While under construction in Orange, Texas, the ½-in thick shells are tacked together into 20-ft sections and moved by cranes to special automatic welding turning rolls specially built by Worthington Pump and Machinery Corporation. These turning rolls rotate the 31-ton sections at the desired welding speeds for the inside and outside automatic welding of the circumferential tacked seams.

The turning rolls was manufactured under

welding of the circumterential tacked seams.

The turning rolls were manufactured under specifications drawn up by Mr. David H. McDermott. superintendent of large assemblies for the Orange, Texas plant of Consolidated Western Steel Company. Mr. W. Brandt. of Big Three Welding Equipment Company, Beaumont. Texas, suppliers of the turning rolls in this area, worked with Mr. McDermott in bringing this job to a conclusion.

Roll Operation

These turning rolls consist of five-power-driven, rubber-tired rollers with a 10-in. face and a 22-in. diameter and five similar idler rollers. A 3 hp motor, together with a Model C Worthington Allspeed Selector provides adjustable welding speeds from 3-in. to 27-in. per minute. A separate 5 hp gear head motor drive provides roller speeds of 100-in per minute for fitting up and final testing of welds. All push buttons are of the pendant type attached to 75-ft long rubber cords so that the operator can

start-stop-reverse or change speeds of rotation from any working position inside or outside of the shell.

Power

The Consolidated Western Steel Company has used a novel method of bringing electric power to the automatic welding heads. The power lines are brought through openings in the stay supporting plates at the center of the shell. The shell is rotated at the desired welding speed in one direction by the power drive on the Worthington rolls and the automatic welding head travels at the same speed in the opposite direction. Using this method prevents tangling or twisting the power lines and allows for continuous rotation of these shells in either direction.

Operation

The large framework shown around the outside of the shell is supported on rollers and can be moved to the desired position over the outside circumferential seams being automatically welded, making it convenient for the operator to inspect and control the automatic welding process. Again the shell is rotated at the desired welding speed by Worthington rolls and the automatic welding head travels in the opposite direction. Using this method means that the automatic welding head remains in practically one fixed position during the automatic welding of the complete circumferential seam.

Assembly

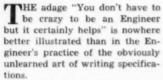
The 300-ft sections are joined together under water as each is placed in position by means of a 5-in pin slipped through matching cast iron lugs installed while section was on the building ways at Orange. Trenie Concrete is then poured around the actual joint, after which the watertight bulkheads between sections are removed by acetylene torches. A ½-in. steel band 19-in wide is then welded across the actual joint on the inside, and additional concrete is then forced through fittings installed in this band to fill any remaining voids. Finish concrete is then completed in the tunnel.

How NOT to Write Specifications

By Helen H. Dunham,

Executive Secretary
Reynolds, Smith and Hills, Architect-Engineers
Jacksonville, Florida

Presented at the Florida Engineering Society 34th Annual Meeting in Tallahassee, Florida.



As a defenseless member of the weaker sex, it is my misfortune to have to transcribe the uncouth noises and the gibberish uttered by Engineers, and endeavor to translate these weird sounds into English.

I urge all Secretaries to Engineers to enroll in a society, which is yet to be formed, but no doubt will be formed by the Secretaries in self-defense. The name of the society suggested by one of the disciple's of Lydia Pinkham is "The

Society for the Promulgation of Information and the Dissemination of Data Looking Towards the Inclusion of a Course of Specification Writing in the Curricula of all Engineering Colleges". The foregoing title as you all will readily recognize is pure Engineeringese, the fourteen syllable multi-worded engineering way of saying what in plain English is "Engineering Secretaries Association".

This society's motto is "Write plain English, you dopes" and its aims and ambitions are to lighten the load of the "poor working girl" to the extent permitted by the eradication of the following particularly bad practices:

 Conferring (telling clean and not-so-clean stories) with man-



ANTERIOR ARCHITECTURE

ufacturer's representatives from 8:00 A.M. until 4:30 P.M. and then starting to dictate complete specifications to be sent to the client in the five o'clock mail.

 Dictating while swallowing two-thirds of a lighted two-fora-nickel cigar or a home-made cigarette, chewing on a candy bar, or drinking a Coca-Cola.

 Dictating while furiously pacing, with occasional sprints down the hallway, so that continuity of speech is lost, or a roving microphone is called for.

 Laboriously writing out, in long-hand, a particularly involved specification, in handwriting that any self-respecting chicken would disown.

 Preparing a holographic (longhand) draft in the Engineer's usual unreadable handwriting and further confusing the issue by spelling the words phonetically rather than according to accepted practice as set forth in Mr. Webster's Unabridged Dictionary.

6. Walking off while in the midst of dictating, to return an hour or so later with the comment "I completely forgot about you",—in other words, adding insult to injury.

Another important item of interruption is the Telephone, that so necessary adjunct to the engineering profession. At any time—but frequently in the midst of a most highly technical specification—understandable only to another Engineer, comes the ring of the telephone. That ring is the signal



PREFARING PROFOUND PROFESSIONAL PROGNOSIS

for a minimum of at least a half hour of talk, argument or harangue, which settles nothing and is merely one Engineer showing off his knowledge to another Engineer—or to a hapless manufacturer's representative who, in the struggle to make an honest living, has become enmeshed in the Engineer's toils. Nothing is settled, and this conversation is but a link in a chain of many such verbose effusions.

Then comes the picking up of the thread of thought, granted of course that there is such a thread, which necessitates backtracking for a page or two of notes, granted also that the secretary has not long since fainted from ennui,—and there exists the apprehension that the phone is not silenced but temporarily resting, to enable each side to recruit fresh arguments, to break forth again at some other equally inconvenient time.

These are but a few of the many trails and tribulations which beset the young lady who is unfortunate enough to take a position in an engineering office in the fond hopes that she will soon be a party to the secrets of Einstein's Theory and Atomic Energy.

It is with great pride and extreme pleasure that I take this opportunity of paying homage and tribute to the august Dean of the College of Engineering at the University of Florida, Dean Joseph W. Weil, inasmuch as a perusal of Dean Weil's article on "Engineering Education" appearing in the current issue of the Florida Professional Engineer, states that the College of Engineering at the University of Florida provides a course numbered C-3 and titled "Reading, Speaking and Writing".

If I may be so bold, I suggest that the subject of spelling be included in the course, and that at least twice as many hours be allocated to the teaching of this course as has evidently been allocated heretofore, inasmuch as the prior products of this course (and of other similar courses at the more enlightened institutions which include any similar courses on these nigher arts in their curricula) are definitely "on the sorry side" insofar as their ability to write or spell the English language is concerned.

No paper on "writing specifications" or "writing" anything would be complete without specific reference to the high disregard Engineers evince for the Spencerian art.

It is amazing to see or try to read the scribbling of an engineering draftsman who, in his engineering work can produce the most complicated drawing and, with the aid of the dictionary and certain other mechanical aids such as a Wrico or LeRoy lettering set, can print the titles, description and data most clearly and distinctly on the drawing.

This same fine engineering draftsman or designer when confronted with a sheet of plain white paper and holding either a pen or pencil in his hand, will produce hieroglyphics far beyond the power of any archaeologist or cryptographer to decipher.

A device that Engineers employ with fiendish glee to cover up (they fondly hope) their sins of omission is called "Issuing an Addendum" which normally involves the issuance of addenda as their multiple sins come to light during the Contractor's efforts to set a bid price within the bounds of reason, and then build the structure so fondly envisioned by the Engineer.

Addenda are as prone to follow specifications as night is prone to follow day.

Next on the agenda of the less endearing traits of some Engineers is the "pack rat" procedure best exemplified by the following common occurrence.

The Engineer decides to include a choice item of information (technically or otherwise) that has been saved for a future apropos occasion. A diligent search of the files. both active and those which have been placed in the "morgue" (that supposed-to-be final resting place of data after a job has been finished) fails to disclose any such information. After much excitement, which generally includes snagging a new pair of nylons and breaking a shoulder strap when reaching up to a morgue file some six feet overhead, the data is finally found reposing on the Engineer's deskwhere the secretary had suggested the search begin-only to have the Engineer vehemently and with



HOLOGRAPHIC HETEROGRAPHY

most injured facial contortions insist that "I gave the data to you you certainly should know where you filed it".

After several repetitions of the foregoing, in any one day, only an all-male jury would hold the girl guilty of murder if she borrowed



ADD ANOTHER ADDENDUM

the axe from the survey crew and made good use of it.

In order to eliminate brushes with the law over hasty actions taken while sizzling and seething with indignation over the Engineer's ways, I have found that judicious use of the mechanical aids I now offer for your inspection are



COLLATERAL CONFERENCE CONCERN-ING CONTRACT COMMITMENTS.

of real help in my work.

The short light riding crop suffices for the office boy, engineersin-training, and some young draftsman. But, for best results on the wind-toughened hides of registered engineers and chief draftsmen. heavy applications of the eighteenfoot rawhide bullwhip are generally required.

Nothing has yet been found that works well on Consulting Engineers, so all we can do is to hope "Clancy will lower the boom" and suffer in dignified silence until he

Beautiful butterflies emerge from cocoons woven by lowly caterpillars-in much the same manner as the final specifications eventually appear. The rough draft is turned over to the luckless secretary by the omnipotent Engineer in FINAL form, all checked, corrected. initialed. and "ready for stencilling"-albeit words have been omitted, and punctuation has the appearance of having descended as rain from heaven, to fall in the proper (seldom) and improper (consistently) places. This necessitates careful editing on the part of

the secretary prior to typing, with the result that the specification turns out very neatly and properly written and the Engineer looks quite smug about the whole thing.

After all of the toil, sweat and tears have been expended, the "final" specifications prepared, collated and bound-and the worn out secretary thinks she is through with her stint-time 11:30 P.M .further troubles befall her when the Engineer turns effeminate, changes his mind, and-"wot hoppen"-the whole darn thing has to be done over.

Missouri Plant Cuts Handling Cost

CINCE acquisition of its first battery-electric industrial truck Jackes-Evans Manufacturing Company, St. Louis, Missouri, has purchased a number of additional units. The present fleet consists of four heavy-duty fork trucks, with capacities of from 2,000 to 4,000 lb; eight battery-powered hand trucks, two of the platform type, and six equipped with forks, and a gasoline-powered truck used mostly for vard duty.

The Company, which manufactures stove pipe, wood burning stoves, oil and gas heaters operates its truck in the warehouse area in the plant basement, as well as on its main or production floor.

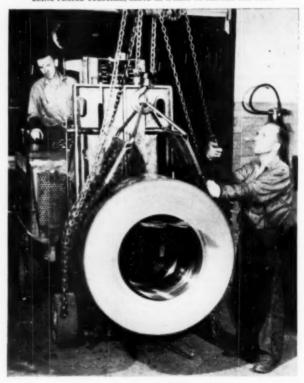
Production

Incoming shipments of various items of material are handled either by the battery-electric industrial trucks, or in the instance of coils of steel, by an overhead crane and by the fork trucks. Steel is received in carload lots of some 50,000 lb at a time. Prior to the use of industrial trucks and the crane for handling, it would take four men approximately half-aday to unload and warehouse a shipment. Now with the aid of a fork truck and a crane operator. the work is done in approximately one hour.

As steel is needed for production it is brought from the stock pile by fork truck, as described, to the area where it is "blued" in a furnace and then passed along to cut- to points along the production line ters that snip the coil into sheets according to size specifications. Bundles of these sheets are moved

by either the battery-powered heavy-duty, or hand trucks of the fork type.

A 5,000-LB COIL OF STEEL, BROUGHT TO THE FURNACE ROOM BY A STORAGE BATTERY-POWERED FORK TRUCK, IS PLACED IN A SLING AT THE END OF THE FURNACE PREPARATORY TO "BLUING OPERATION". TRUCK'S FORKS, BY BEING PLACED TOGETHER, SERVE AS A RAM TO HANDLE THE COIL.



SOUTHERN POWER & INDUSTRY for AUGUST, 1950

	INSPECTION CHART	
Item	What To Do	How Often
Sleeve Bearings	Check temperature and Oil Supply.	
	Check clearances and conditions of Journals	Frequently
Dall Bassines	The state of the s	and the same of th
Ball Bearings Vacuum and Back	Listen for sounds of broken balls, cracked race, etc	Once a watch
Pressure	Check for changes	Daily
Steam Strainers	Clean	Quarterly
Gages and Ther-	- Citali	- Second serving
mometers	Calibrate for correctness	_Quarterly
Gland Packing		Annually
Governor		Daily
Emergency Trip	Check with shaft tachometer	Monthly
Shut-Down Turbines	Jack over 14 turns	Daily
	Circulate lubricating oil through the system	Daily
	If turbine has its own condenser, run air pump	
	to keep dry	Daily for 1 hou
	Check casing drains to remove water	Daily
	Drain water from lubricating oil system	Daily
	Operate all valves to prevent sticking	Weekly
	Check all piping joints for leakage	Weekly
	Inspect interior if casing manholes or hand holes are provided	Quarterly
Coupling	_Inspect condition	Quarterly
Thrust Bearing	Check temperatures and sounds	Frequently

A Guide to Turbine Maintenance

-PART 2-

Maintenance to support capacity and efficiency: removing deposits, repairing nozzles, tightening joints and detecting flaws.

By Robert H. Emerick

Consulting Mechanical Engineer North Charleston, South Carolina

THE first part of this article which appeared in the July issue, dealt with general maintenance of moving parts, such as bearings, rotor, etc. Here we are concerned primarily with maintenance to support capacity and efficiency, such as the removal of deposits, repairs to nozzles, the obtaining of tight joints and the detection of flaws, normally invisible to the eye.

Loss of Efficiency

A loss of turbine efficiency, the symptom of which is a more or less distressing increase in the steam rate, leads us to suspect that:

- (a) Something has happened to increase the back pressure.
- (b) We are suffering from an erosion of the nozzles, steam cuts between the stages, deposits on the blades and nozzles, or a combination of these ailments.

Back Pressure

Increases to the back pressure are far more destructive to operating economy than are decreases in throttle pressure. For example, supposing we have a 50 horsepower turbine driving a pump using steam normally of 100 psig dry and saturated at the throt-

tle, and exhausting into a condenser which provides 4" of mercury back pressure (26 inches of vacuum) when the barometer reading stands at 30 inches.

Referring to a Mollier diagram or a steam table, we note that the steam at the throttle contains 1189.6 Btu per pound. Next we drop down the diagram in a straight line to 4" of mercury back pressure, and discover that the heat escaping with the exhaust steam appears to be 925 Btu per pound. Therefore by simple subtraction, 1189.6 — 925, we should have 264.6 Btu per pound for useful work in the turbine.

Actually of course these 264.6 Btu are only theoretically available. The nature of heat energy being what it is, we shall be able to employ only a portion of these Btu in the turbine. However we are not concerned with a study of thermal design at this time, but are merely seeing for ourselves what an increase of back pressure will do to our pocketbooks, via the turbine's steam rate. Incidentally we cannot take figures from a steam table when computing the expansion in a steam turbine, because ideal expansion is based on very special stipulations. Consequently the Mollier diagram is necessary for reference under ideal exhaust conditions, and we have used it in obtaining the 925 Btu at 4" back pressure.

Supposing now that our condenser springs a leak and the back pressure jumps up to 10 inches of mercury. The Mollier diagram breaks the bad news that our exhaust is now carrying away 973 Btu per pound. In this condition the heat theoretically available for useful work is 1189.6 — 973 or 216.6 Btu per pound.

Thus by an air leak in the condenser our available heat has been reduced from 264.6 Btu per pound, down to 216.6, Obviously, to make up for this reduction of 48 Btu in available heat, we must feed the turbine more steam, a procedure that will pain our pocketbooks considerably.

By comparison, we could drop the throttle pressure all the way down from 100 pounds to atmospheric pressure, and the reduction in Btu available for work is only 39.2 Btu per pound of steam.

For those of us who want to determine the effect of pressure changes on the theoretical steam rate, here is a formula:

Theoretical Steam Rate Per Turbine Horsepower = 2544 ÷ Available Energy in Btu Per Pound of Steam.

The 2544 of course is the Btu equivalent of one horsepower, and the theoretical steam rate is based on an assumption of 100% mechanical efficiency.

A short method for evaluating the effects of changes in back pressure is offered by SOUTHERN POWER AND INDUSTRY in its premium book "Charts". Chart No. 42 from that book is reproduced here as Fig. 1. All that we have done with the Mollier diagram and steam table appears on this chart in terms of the result. For example, ascend the 4" back pressure line to the 100 psig throttle pressure curve, and there is our 264.6 Btu, by interpolation, to the left. Efficiency, quality of exhaust and the

theoretical steam rate in kwh, all may be read from this chart. Keep this chart handy, and you can tell at a glance the effects on your operating economy of any changes in the back pressure for turbines within the range covered.

Erosion

The cause of an increase in the steam rate is sometimes found in

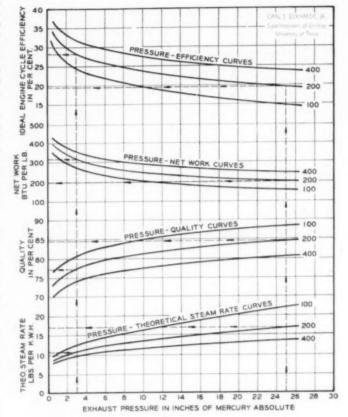


FIG. 1. EFFECT OF VARYING EXHAUST PRESSURE

The initial steam condition is dry and saturated—curves for 100, 200 and 400 lb per sq in, abs are shown.

Example: The change in theoretical steam rate, quality of exhaust, net work, and ideal [Rankine engine] cycle efficiency resulting from changing the exhaust pressure from 25 in. Hg abs to 3 in. Hg abs (the initial steam pressure being 200 lb per sq in. abs, dry and saturated), is found from the chart to be:

	At 25 in. Hg	At 3 in. Hg
Theoretical Steam Rate, lbs/kwh	17.0	10.9
Quality of Exhaust, per cent	84.7	77.9
Net Work, Btu/lb	201	314
Efficiency, per cent	19.5	28.2

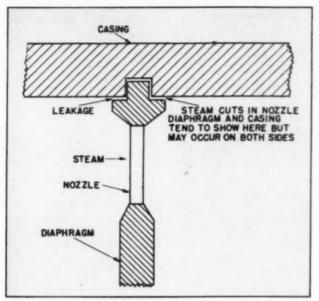


FIG. 2. SHOWING DIAPHRAGM CUTTING.

eroded nozzles. In these cases, if a smoothing down and cleaning will not suffice, we must replace them. Steam cuts between stages have a similar ill effect on the steam rate, and require some special treatment.

Generally interstage cuts develop under the nozzle diaphragms. If we take out the diaphragms we must be exceedingly careful not to scratch the machined surfaces, for a tiny gully in steel, barely visible to the eye, soon becomes a grand canyon of leaking steam when returned to service. We can machine the diaphragm back a little, but very little, as heavy planing will change the designed clearance and relationship between nozzles and wheels.

Sometimes we can stop leaks by silver soldering, and do it without removing the diaphragms. Welding is not recommended because the intense local heat is almost certain to warp or distort the casing. Silver solder however can be applied at temperatures between 1100 and 1200 degrees, and with reasonable care no trouble ensues.

Washing

Removing deposits on turbine blades should be accomplished either by washing, or by blasting with compressed air and fly ash. Sand as a blasting agent should be avoided, as it will swiftly rough up, and even cut away, the nozzles and blades. Even a mild fly ash has some abrasive effect. It is unfortunate that washing is ineffective against certain water resistant materials.

Under favorable conditions we can at times wash a turbine without removing the rotor from the casing. The procedure is to drop the temperature of the inlet steam low enough to produce wet steam in the turbine. If the steam is superheated, we must desuperheat ahead of the throttle valve by a water spray introduced into the steam line. This is the simplest way of desuperheating, and one that produces steam of uneven temperature and quality, for we can have a stream of water and a stream of superheated steam in the same pipe, but the overall results are normally good enough for our washing purposes.

During the washing period, vacuum should be maintained on the condenser. The wash water, accumulating in the condenser hot well can be pumped back into the boiler or to waste, as desired. If pumped back into the boiler, the concentration must be watched to keep it within bounds, and a measure of blow down may be required. The turbine is operated at a speed much lower than normal while washing is in progress. There are records of operators washing turbines successfully while the machine was under full load; the procedure is dangerous however, especially for turbines driving electric generators. In some circumstances, a brief falling off of turbine speed may burn up the generator.

Another method of water washing calls for us to half fill the turbine casing with water, while the rotor is stopped. The water should be condensate of a temperature calculated to avoid thermal stresses. If there are thermocouples in the casing, determination of the proper temperature is easy, otherwise we must use our judgment. We next use the jacking gear to turn the rotor, and continue to turn it until a check of the wash water shows that no more solids are being removed.

Solids not soluble in water have been removed successfully in many instances by washing with a 10 per cent solution of caustic soda. The solution is introduced with the steam, as illustrated in Figure No. Sufficient steam is admitted to turn over the turbine at from 100 to 200 rpm, and this slow rotation is continued until caustic appears in the hot well. Then the throttle valve is closed, and the caustic feed stopped while the solution inside the turbine is given time to react with the deposits. The time interval is usually from 15 to 20 minutes. This procedure should be repeated several times, thereby giving rise to an overall washing time of several hours. When we are convinced that the caustic has done all it can do, we should wash out the turbine with condensate. introducing the condensate through the steam line in the same manner that we used for the caustic, As before, the steam admitted with the condensate should give us 100 to 200 rpm of the rotor.

There appears to be no record of the caustic reacting unfavorably and starting up caustic embrittlement, the time factor and subsequent washing apparently acting as a preventive. However plans to

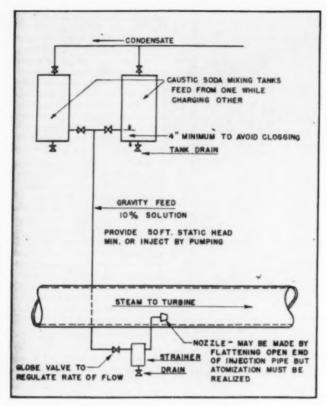


FIG. 3. SUGGESTED METHOD FOR CAUSTIC INJECTION.

- Notes:
 (1) Omit caustic strainer if steam strainer exists in steam line between caustic nozzle and turbine.
 (2) Feed solution at rate of 2 gallons per minute.
 (3) Feed pure condensate through nozzle for post-caustic washing.

wash with caustic soda should be chemical supply house. It comes cleared with the turbine manufacturer before starting the procedure.

Cracks

When we are inspecting a turbine, the presence of cracks sometimes too small to be seen by the naked eye, can be detected by the use of a dye and talcum powder in this way:

(a) Clean the surface thoroughly with gasoline or kerosene. Do not clean with either alcohol or carbon tetrachloride as both of these materials become corrosive if moisture is present.

(b) Spray on a dye made up of alizarin dissolved in a solution of 8% soluble cutting oil, 5% oleic acid, and 87% Diesel fuel oil. The alizarin can be obtained from a

as a powder or paste and is commercially used as a gasoline dye.

(c) After ten minutes, wipe off the solution with a rag dampened in gasoline.

(d) Let the surface dry for one minute, then dust with talc.

Now if there is a flaw, the dye seeps back into the talc powder and shows up more vividly than a sore thumb on a pianist. This method works very well with rough surfaces. For highly polished surfaces, lamp black sometimes will reveal cracks more emphatically than tale.

In the event that alizarin is not handy, and time is pressing, we can use a substitute method employing kerosene and whiting, or chalk. After the surface has been thoroughly wetted with kerosene, time

is allowed for soaking into possible cracks, then the surface is wiped dry and clean. Whiting or powdered chalk is then dusted on, and if a crack exists, the kerosene will soak back into the powder.

The alizarin is the more sensitive agent, but kerosene and whiting will do very well in most cases

Magnafluxing and X-ray pictures are quite valuable in detecting hidden defects, but equipment for these approaches to the problem is not often available in the average plant.

Tightening Joints

At times one of our most stubborn problems is to make up a casing joint that is steam and vacuum tight. Our first care in making a joint is to be sure that the contacting surfaces are scraped clean and then polished. We now have several choices of jointing material, excluding sheet packing which is not suitable. Here they

(a) A paste of graphite and boiled linseed oil can be readily whipped up in any shop.

(b) For moderately high temperatures, up to 700 degrees F, we can use strips of an unvulcanized rubber, made by the United States Rubber Company, and sold under the trade name of Usudurian. The strips come in sheets. 36" wide and 1/32" thick, and may be cut to any desired width for application,

(c) For temperatures above 700 F, a plastic compound manufactured by the National Engineering Products Co., Washington, D. C., and known as Copaltite, has been used with considerable success. This plastic also can be used for "shooting" a joint, provided the turbine is grooved by the builder for this purpose.

Other proprietary compounds such as Manganesite and Furmanite are available for turbine jointing, but whatever is used, we must be sure the material is suitable for the steam temperatures involved. In fact the first prudential rule, is that we secure the turbine builder's recommendation and approval before adopting any material.

Preventive Maintenance

Summarizing the overall situa-

tion, wherever and whenever trouble appears with our turbines, the chances are that we have overlooked one or more items on the preventive maintenance schedule set forth on the chart accompanying this article. For example, few of us would attempt to feed more steam into a turine that was already showing signs of distress; but our sins of omission can produce results equally deadly.

As a case in point, consider the effects of wet steam. Water not only substantially reduces our turbine efficiency, but moisture in the form of drops traveling at high speed actually does physical damage to the nozzles and buckets. Every turbine service man is familiar with the ragged and cut edges, the raw surfaces of turbine internals, that have resulted

directly from bullet-fast slugs of water.

Perhaps we know these facts, and yet, how long have we tolerated wet steam to the turbines without doing a thing to correct it? Why don't we start now to protect our turbines and our plant productivity with separators, proper water treatment, or a boiler big enough to carry the load without the forcing that breeds water carryover?

If we consider the situation, we are likely to realize that turbine trouble is more often the fault of ourselves than the machine. This realization is the first step toward less and cheaper maintenance.

Reference Data

Here are some helpful publications for the turbine operator and maintenance engineer:

The Chart Book—Compiled by Southern Power and Industry. Figure No. 1 has been abstracted from this book.

Modern Turbines—Edited by Louis E. Newman. Published by John Wiley and Sons, Inc.

Naval Machinery—Published by the United States Naval Institute, Annapolis, Md.

Instructions for the Operation and Maintenance of Main Propelling Machinery, Section 1, Turbines. For sale by the Supt. of Documents, U. S. Government Printing Office, Washington, D. C. Price, 15c.

Silica Deposition in Steam Turbines— Straub and Grabowski, Transactions of the A.S.M.E., July, 1945.

Removal of Water—Insoluble Turbine Deposits by Caustic Washing, Webb and McCall, Transactions of the A.S.M.E., October, 1943. How To Maintain Turbines—General

Electric Company.

Identification and Prevention of Steam Turbine Blade Deposits— Allis-Chalmers



Westinghouse to Build New Plant in Birmingham, Alabama

Because of the increasing industrial importance of the South, the Westinghouse Electric Corporation has decided to build a new plant at Birmingham, Ala.

O. O. Rae, Southeastern District manager for the company, said the new plant will be operated by the Westinghouse Manufacturing and Repair Department. It will provide extensive overhaul and repair facilities to serve customers in all parts of Alabama.

A site already has been secured for the new plant. A tract of land 400 ft by 300 ft has been purchased on Third Avenue South, between 33rd and 34th Streets, one mile east of downtown Birmingham. The new location is on a siding of the Southern Railroad, and on the main highway to Atlanta.

Construction will begin immediately on the new plant, which will consist of two one-story brick and steel buildings with a total of approximately 50,000 sq ft of floor space. It is estimated that the buildings will be completed by June, 1951.

In one building approximately 15,000 sq ft of space will be used as a warehouse, and 5,000 sq ft as office space.

The second building with approximately 30,000 sq ft of space will be devoted to manufacturing and repair department activities. It will contain facilities and equipment to overhaul and repair industrial equipment, such as large motors, transformers and diesel-traction generators.







Flora Pipe Company of St. Louis, Nordberg Mfg. Co., and the Aluminum Company of America were three of the twenty-nine exhibitors at the A.S.M.E. Oil & Gas Power Division meeting in Baltimore, Md.

Radial Type Engines and Corrosion Discussed by A.S.M.E. - Baltimore

NCE again the South welcomed the members of the Oil & Gas Power Division of the American Society of Mechanical Engineers, this time at the Lord Baltimore Hotel, in Baltimore, Maryland, June 12-16. One of the most active of all ASME Divisions, The Oil and Gas Power group met for a full work week and spent the greater part of this time, morning, afternoon, and evening, in technical session.

Monday afternoon and evening were given over to the OGP Lectures, a special feature of each annual meeting. These lectures are not part of the regular sessions, and the papers are not printed as part of the technical program. They are lectures presented by outstanding experts, who need not necessarily be members of the society. This year the subject of the lectures was "Corrosion-What it is and How it Affects Internal-Combustion Engines". While this subject was aimed at engineers interested in internal-combustion engines, it turned out that much of the data presented was of value to all engineers connected with operation or maintenance of industrial plants.

20 Causes of Corrosion

The first of the lectures, "Fundamentals of Corrosion", by Dr. R. H. Mears, Manager, Research LabHow corrosion affects internal combustion engines and the design features of the new Nordberg radial type engine featured at A.S.M.E. Oil & Gas Power Division meeting in Baltimore.

oratories. Carnegie-Illinois Steel Co., discussed corrosion in general. He pointed out that there are more than twenty different causes of corrosion, and almost as many ways to prevent it. However, design of industrial equipment, according to Dr. Mears, is the major factor in determining resistance to corrosion. Sharp corners, edges, and breaks in the surface of the metal are more subject to corrosion than the plain surface of the metal itself. Even scratches on metalic surfaces are more subject to corrosion than the smooth surrounding area.

Cathodic Protection

Dr, Mears took note of the excellent work being done with cathodic protection in preventing corrosion, but he pointed out that even this method is not without its faults. In some instances it has been found that the currents set up with cathodic protection have caused the formation of hydrogen blisters on the surface of the metal being protected, and these blisters are more injurious to the metal than mild corrosion.

Chromates

At the evening lectures, John F. Wilkes. Technical Director, Railroad Department, Dearborn Chemical Company, presented an excellent paper on "Corrosion on the Water Side of Internal-Combustion Engines."

In this paper he stated that the use of chromates in cooling water for both large and small internalcombustion engines had been found to be the best way to prevent corrosion within the cooling system. He described the results of a number of experiments in this field which had all clearly indicated that corrosion is absolutely avoided if the proper percentage of chromate is kept in cooling water. On the other hand, it was also discovered that too low a percentage of chromate aids rather than prevents corrosion.

It seems that chromate deposits a thin film over the surface of the metal in the system, and that as long as this film is continuous and heavy enough, the metal is protected from oxygen or other corrosive agents in the cooling water.

However, if this film should be spotty or broken, it can form the equivalent of a blister over the metal, retaining in this blister gases or liquids of a corrosive nature. Since these corrosive agents are between the protective film and the metal, and since they are stationary and in direct contact with the metal, severe local corrosion is the result. In other words, better no chromate than not enough

This reasoning applies not only to the cooling systems of internalcombustion engines but to the liquid side of heat exchangers or any other industrial equipment. It is an important point, and one that operating and maintenance engineers should note. Wilkes said that his company had just brought out an inexpensive test kit containing papers which will turn various colors, as does litmus paper, when tested with water containing chromate. The color of the test spot indicates the percentage of chromate. The use of such a kit makes it simple for any operating man to test the water in his equipment to see that the proper amount of chromate is present.

Moving to the other side of the engine, A, R, Schrader presented a lecture. "Corrosion on the Combustion Side of Internal-Combustion Engines", which he had prepared with W. E. Robins. Both of the authors are with the U.S. Navy Experiment Station at Annapolis, Maryland. In this lecture, the au-

thors claimed that their experiments indicate that sulphur in the fuel is the chief cause of corrosion in the cylinders of internal-combustion engines. According to their findings, sulphur does its bad work at low temperatures, and corrosion is best avoided by maintaining a fairly high engine temperature. In line with this, it was found that many starts and stops, which permit cooling of the engine and considerable operation with the engine cool, lead to greater corrosion. Of course, the use of fuel oil low in sulphur content is the best solution providing such fuel is available at a reasonable cost.

Schrader recommended that oil be changed frequently (as frequently as every 120 hours for best results) and the use of additive type, super duty oils. While these oils cost about half again as much as regular oils, they have shown as much as 61 per cent reduction in top ring wear.

Following the lecture, a number of commentors came up with data of their own which seemed to discount sulphur as a cause of corrosion, but Schrader was able to rather well substantiate his findings if confined to the higher speed Diesels on which his experiments were conducted.

Radial Diesel

At the first technical session, Emil Grieshaber, Chief Engineer, Nordberg Manufacturing Co., presented a paper which he had writ-

A. R. SCHRADER OF THE U. S. NAVAL ENGINEERING EXPERIMENT STATION.

Annapolis, Md., presented a lecture on "Corrosion on the Com-

BUSTION SIDE OF INTERNAL COM-

BUSTION ENGINES'

INSTEAD OF DRIVING DIRECTLY FROM ONE CRANK WITH A MASTER ROD IN THE CONVENTIONAL RADIAL, THIS EN-GINE USES A PLANETARY GEARING AR-RANGEMENT. THE ILLUSTRATION IN-DICATES CLEARLY THE OPERATION OF THE DRIVE FROM THE PISTONS (THERE ARE ELEVEN IN THIS ENGINE) TO THE MAIN DRIVE SHAFT.

ten in conjunction with Donald I. Bohn. Chief Electrical Engineer, Aluminum Company of America. It dealt with the design features of the new Nordberg Radial Diesel, 120 of which are now in operation in one of the Aluminum Company's southern plants (see SPI for June-p 42-for description). There are a number of new design features incorporated in this new engine, and according to operating experiences in the Aluminum Company's plant, they are doing a fine job. Actually, the engines now in use are not Diesels but natural gas engines, but the engine is suitable for use with practically any liquid or gaseous fuel.

(Continued on page 103)

J. D. JONES, GULF REFINING COM-PANY, TULSA, OKLAHOMA, AND RICHARD A. WHITING, PUBLIC SERV-ICE CO. OF NORTHERN ILLLINOIS, CHICAGO, ILL., TAKE OUT A FEW MINUTES BETWEEN SESSIONS TO TALK OVER OLD TIMES

JOHN F. WILKES, TECHNICAL DIREC-TOR, RAILROAD DEPARTMENT, DEAR-BORN CHEMICAL COMPANY, POINTS OUT A CORROSION POINT DURING HIS LECTURE ON "CORROSION ON WATER INTERNAL COMBUSTION ENGINES." SIDE OF







SOUTHERN POWER & INDUSTRY for AUGUST, 1950

Electric Boilers Supply Process Steam for Alabama Plant

By Stanley Livingstone

President, Electric Furnace Corp. Chattanooga, Tenn.

Steam electric boilers save space, reduce losses, and are subject to exact control. Therefore they can frequently compete with small conventional boilers using cheaper heat.

A N unusually large installation of steam-electric boilers in the Huntsville, Alabama, plant of American Rubber Corporation has now been in operation long enough to permit a report on economy and performance. Among the accomplishments claimed are reduction in heat losses and savings in steam, reduction in the molding cycle of 40 per cent, a great reduction in seconds and rejects, and greatly improved consistency in color of product.

After the destruction of plant and equipment by fire at Miami, Florida, in January 1947, where they made shoe and mechanical rubber goods, the American Rubber Corp. acquired part of the Redstone Arsenal at Huntsville, Alabama, in June 1947, and installed a battery of presses and complete equipment to produce rubber floor tile. The existing boiler house, with two 125 hp oil fired boilers, was situated 1250 feet from the molding building and it was

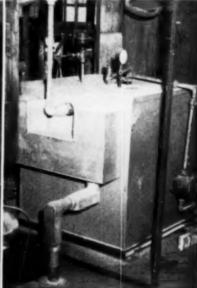
difficult to maintain satisfactory molding temperatures in the platens.

Electrically generated steam in sufficient volume to operate a factory was something new. Mr. Walker W. Bonifay, the plant engineer, became interested in electric steam boilers primarily because they have great power flexibility with self regulating pressure control. Even though not fully convinced of their practical application at that time he placed an

PHOTOGRAPH AT LEFT SHOWS THE FIRST ELECTRIC BOILER INSTALLED, AND THE ONE AT RIGHT IS OF LATER TYPE.

NOTE THE SMALL COMPACT BOILERS AT CENTER OF EACH PHOTO ARE SET CLOSE TO THE PRESSES TO CONSERVE
SPACE AND REDUCE STEAM DISTRIBUTION LOSSES.





SOUTHERN POWER & INDUSTRY for AUGUST, 1950

initial order for one Speedylectric boiler from the Livingstone Engineering Company.

The first boiler arrived on a Saturday, was installed on one press on Sunday, and was placed in operation on Monday. The pressure was carefully set to match the central boiler pressure (which was operating the rest of the presses) and the press was loaded with stock. With the electric boiler adjacent to the press there was practically no heat loss, therefore the tile was badly overcured. To avoid overcuring the molding time was reduced 40%, which resulted in an important increase in production. The electric steam was free of line condensate, and precision pressure control eliminated color variation in the product. The fact that identical cures were secured from both upper and lower platens of the press made spectacular savings in steam.

Needless to say, additional orders were placed for boilers until the whole plant was operating exclusively on electric steam. Finally, all use of other steam was discontinued—even including space heat.

PRINCIPAL DATA

Electric-Steam Boilers — American Rubber Co. Huntsville, Alabama

	ifacturer ber Installed	Livingstone Engineering Co.
Type		Electrode Type. Steam is generated ir to the passage of current between

Control	Speedylectric	control provides au-
tomatic regulation of the	desired pressure	and current. No low
water cutoff is required.		

Capacity	6 Boiler hp-180 lbs/hr	
Electrical Demand	60 kw at full load	
Thermal Efficiency	98%	
Power Factor	100 %	
Pressure and Temperature	200 pounds at 388 F	

Better quality at less cost has enabled American Rubber to book a larger volume of business at a satisfactory profit margin, when volume and margins generally have been shrinking.

In addition to producing rubber tile, American Rubber Company has cooperated with Livingstone Engineering Company to act as a field test laboratory for their Speedylectric boilers. Electrodes, electrolytes, current densities—any idea that Livingstone research engineers turn up with is subjected to 24 hours a day performance tests in the Huntsville plant.

Both companies have already benefited materially, and continued cooperation indicates that additional benefits may be expected in the future.



Nuclear Power for the Individual

Latest peacetime application of atomic energy refutes many recently published statements that nuclear power is not for the individual.

Answer to the duffer's prayer is the radioactive golf ball, which makes it possible for a caddy carrying a small, portable Geiger Counter to locate the "atomic" ball even when hidden in dense woods or deep rough. Minute quantities of radioactive materials are embedded under the cover of the ball.

Location of a lost ball can be telegraphed by the Geiger Counter by flashing a light on the instrument or by signals which the caddy can hear through head phones.

Production of the activated golf balls at the B. F. Goodrich Research Center is entirely experimental and no sale is contemplated at the present time. However, there is a new Geiger Counter on the market which weighs only ten ounces and costs about \$25, the price of about 25 golf balls.

A System of Water Treatment for Boilers up To 900 Psi - With Low Make - Up

PART I

This 3 article series describes a successful system of treatment including operating limits and methods of control. Part 1 presented here covers Preparation of Raw Water Make Up and Evaporation Operation. Part 2 will deal with Boiler Feedwater, and Water in the Boiler. Part 3 will cover Chemical Analysis Correlation Chemical Treatment, and Blow Down Procedures.

By Charles L. Wolff,

and

Irving Leibson.
Student Engineer
Florida Power and Light Company
Miami, Florida

INTRODUCTION

TODAY, as a result of increasingly difficult maintenance problems encountered in high pressure boilers, the careful preparation of boiler feedwater makeup and the accurate chemical control of boiler water are very important. The aim of the water treatment process in steam power stations is the minimization of scaling, embrittlement, corrosion, and boiler carryover in order to avoid costly and difficult maintenance work. In this article, we shall present a system of water treatment, including operating limits and methods of control, which has been used successfully for boilers up to 900 psi with 3% or less evaporated makeup.

No claim is made of complete originality for all of the ideas contained herein although many original ideas and developments are included. Most prominent among the original contributions in the article are the Phosphate-pH Coordination Curve derived from calculations employing the dissociation constants of phosphoric acid, the development of the boiler water analysis cross check correlation, and the fixing of proper operating limits for various waters in the plant.

No bibliography is given, inasmuch as the basis of knowledge for the preparation of this paper is the constant contact with the literature over a period of years while gaining actual field experience. No organized search of the literature was made. The purpose here intended is not to quote from the literature or to take odds with the exponents of other treatment methods or limits but rather to furnish the power plant engineer with specific, direct, and concrete instructions that insure optimum operating conditions and minimum maintenance.

The following introductory paragraphs discuss precautions in preparing raw makeup water for evaporation. The type of treatment and equipment necessary is determined, in each specific case, by the chemical analysis of the raw makeup water to be employed. In some cases, raw water may be so pure that, prior to evaporation, no treatment is required. This is not true for the vast majority of installations. Most ground and surface waters contain considerable impurities in the form of hardness as bicarbonates, free carbon dioxide, silica, sulfates, sulfides, hydrogen sulfide, ammonia, albuminoid nitrogen, and oxygen.

PREPARATION OF RAW MAKEUP WATER

Hardness may be quantitatively reduced by utilizing the lime treatment in a sludge blanket type softener. Whereas bicarbonates are not completely decomposed in the evaporator preheater to remove all possible carbon dioxide; they are completely decomposed to carbonates in the evaporator proper, with the evolution of carbon dioxide to the evaporator vapor. Furthermore, the carbonates thus formed, are themselves partially decomposed to form sodium hydroxide with the evolution of more carbon dioxide.

A lime treatment softener which will considerably reduce high alkalinity, thus will proportionately reduce carbon dioxide in the evaporator vapor. For example, the installation of the lime treating process in one instance reduced carbon dioxide in the evaporator vapor from as high as 130 ppm to 10 ppm CO.

The sludge blanket type softener employing ferrous sulfate as a coagulant is often found superior to older designs employing alum. The ferrous sulfate coagulant possesses the property of removing slight amounts of oxygen and forming the common hydrate of ferric oxide. The ferric oxide adsorbs some soluble silica, thus accomplishing some reduction of silica concentration. The sludge blanket bed is very effective in removing suspended particles from the effluent. A non-siliceous type filter should be employed to remove any carryover from the lime treatment proc-

With an effluent of high pH, a rise in soluble silica concentration has sometimes been noted after sand filtration. It is recommended that effluent from the lime softener be maintained at a bicarbonate

alkalinity (M-2P) equal to from 6 to 12 ppm CaCO. This results in a pH of approximately 9.6 and a calcium hardness from 30 to 40 ppm CaCO. At this operating point, little if any magnesium hydroxide is precipitated. Where carbonate content is greater than that equivalent to calcium, the addition of calcium sulfate drives more bicarbonate out of solution as calcium carbonate. The use of calgon (sodium hexametaphosphate) in the effluent helps prevent post-precipitation of calcium carbonate in the makeup water lines

In many instances, raw water contains intolerable concentrations of free hydrogen sulfide, sulfide ion, and in some cases, ammonia and albuminoid nitrogen. In some plants, the problem of ammonia in the makeup water is the cause of so much concern that insufficient attention is given to free hydrogen sulfide and sulfide ion concentratios that may be present. In some waters, the negative sulfide ion combines with positive ammonium ions to form ammonium sulfide which is even more corrosive than either ammonia or hydrogen sulfide. Furthermore, the ammonia present is held in solution in the ionized form by the negative sulfide ion concentration.

Aeration of a raw water containing bicarbonate alkalinity together with free hydrogen sulfide and sulfide ion, is effective in removing hydrogen sulfide. However, sulfide ion cannot be disposed of in this manner. Breakpoint chlorination is successful in eliminating this corrosive agent. This treatment also partially eliminates ammonia and, to some extent, decomposes albuminoid nitrogen.

In practice, the treatment process may be accomplished by feeding chlorine into the influent of a large raw water tank or basin of such capacity as to result in a satisfactory retention period. The chlorine concentration to be established is determined by the concentrations of those impurities to be eliminated. In some units, heavy deposits of sulfides are formed on metal surfaces exposed to untreated raw makeup water. Upon the addition of chlorine well past the break-point, no further difficulty of this nature is encountered.

The remaining unreacted residual chlorine concentration may be removed by continuously injecting a chemically equivalent amount of sodium thiosulfate in the lime and coagulant treatment, (sodium sulfite may also be employed for this purpose). This step is necessary inasmuch as some ion exchange materials absorb free chlorine one hundred percent and are decomposed too rapidly by chlorine concentrations greater than 0.4 ppm.

It has been observed that under certain conditions, synthetic ion exchange beds capable of acting on either the sodium or acid cycle tend to adsorb ammonia. If during regeneration, sufficient acid is added together with the regular salt regenerant to completely neutralize the bed, then when operation is resumed, ammonia will be absorbed from the inlet prepared

makeup feedwater. This effect is accompanied by a change in influent pH of 9.6 to some lower value for the effluent from the bed. As the freshly regenerated bed is operated, the pH of the effluent from the bed rises until it reaches almost that of the influent prepared makeup water. At this point, the absorption of ammonia ceases. In this manner, some reduction in ammonia concentration may be accomplished for waters of alkaline pH. The primary purpose of the zeolite ion exchange treatment is softening of the water by replacing cations such as calcium and magnesium with sodium and thus reducing scale in the evaporator.

The last step prior to evaporation is the removal as completely as possible of the remaining free hydrogen sulfide, oxygen, carbon dioxide, and ammonia from the



Southern States Display Unit Tours Country

Southern States Equipment Corporation of Hampton. Georgia. sent its second mobile display unit on the road in May to demonstrate SS power transmission and distribution equipment to utility people throughout the Southeast and on up the eastern seaboard. The unit will eventually reach every state.

The orange and green truck will carry a comprehensive selection of Southern States' newest equipment and samples of the latest designs in many Southern States models of long standing acceptance. An automatic switch operating mechanism makes possible pushbutton control of one of the SS switches in the display.

Field engineers **Thomas H. Ellison** and **Thomas D. James**, **Jr.** will take turns accompanying the unit, and each will be joined by a sales representative for the area in which the unit is traveling.

The first SS mobile display unit, which went on the road in March, 1948, covered over 50,000 miles and was viewed by thousands of utility men in 39 states. The new truck will visit all 48 states in its coast-to-coast tours.

prepared makeup feedwater. In most plants, a tray type deaerating evaporator preheater equipped with a vent condenser effects the almost complete removal of these gases. However, there are certain important precautions to be emphasized with regard to the removal of very soluble gases such as ammonia.

Normally, the drippings of the vent condenser are received by a drip pan and returned to the preheater by an internal drip leg through a loop seal. However, for a prepared makeup feedwater containing an appreciable ammonia concentration, the recovery of this liquid is not desirable. In this case, the loop seal should be removed and the drippings passed through the neck of the vent condenser to an outside sewer. The inclusion of an orifice in the line to the sewer provides adequate drain and sufficient venting. Thus, the vent line préviously employed may be removed.

The following explains the need for discarding liquid condensed on the tubes of the vent condenser. At the relatively high pH of 9.6. ammonia is quantitatively liberated in the water section of the deaerating preheater. The condensate in the vent condenser is at a lower pH, in the neighborhood of 7. Water at this pH has a marked affinity for ammonia and redissolves almost all of the gas. Thus, if we are to eliminate ammonia from the makeup, this liquid should be discarded. Although a slight loss of evaporator feedwater results, there is no appreciable loss of heat recovery in the vent condenser.

In general, makeup feedwater preparation should:

- Eliminate corrosion producing substances such as hydrogen sulfide, sulfide ion, carbon dioxide, bicarbonate, ammonia, and albuminoid nitrogen.
- Reduce hardness in order to prevent evaporator scaling.
- Lower total solids in order to keep evaporator blowdown to a minimum.

This brief outline of the preparation of makeup feedwater for evaporation is not detailed and not complete. It is not intended to be anything but an indication of the many details that are sometimes overlooked in design.

EVAPORATOR OPERATION

If the proposed system of boiler water control is to be effective, attention must be focused on careful evaporator operation. The evaporator control system must anticipate and eliminate any condition which would be conducive to priming and carryover. To maintain the proper total solids concentration, a continuous blowdown line with a calibrated micrometer valve should be installed. Two continuous recording conductivity meters are necessary. One cell should be installed to provide a continuous record of the conductivity of the evaporator vapor. However, this in itself can provide only an indication of existing evaporator condi-

It is not sufficient to anticipate incipient changes and to provide the necessary protection against priming and carryover.

The second conductivity recorder should possess an instrument range of 0 to 10,000 micromhos. Its sample cooler and cell should be installed to measure the conductivity of the evaporator shell water in the continuous blowdown line. This recorder together with the calibrated micrometer valve provides the operator with a means of accurate and precise evaporator control.

To determine the optimum operating condition, shell water solids concentration should be varied and the corresponding evaporator vapor conductivity should be observed under all conditions of loads and load changes. The control point should be fixed at that value of shell water conductivity which provides minimum blowdown and yet maintains proper evaporator vapor conductivity. For initial trial, a shell water specific conductivity of 5,000 micromhos is All conductivity recommended. cells should be checked frequently both for cell constant and for cell leakage.

Boiler blowdown direct to the evaporator is recommended for the increase of plant cycle efficiency and decrease in plant water consumption. A well lagged continuous blowdown line fitted with a calibrated micrometer valve should be installed from the boiler to the evaporator. Continuous blowdown is more efficient in reducing boiler concentrations, easier to control, and less upsetting to boiler operation than the use of main blowdown valves. The main blowdown valves should be operated once every two weeks to clear lines and bottom drum of any possible accumulation of sludge.

The evaporator when out of service, acts as a blowdown tank for the continuous boiler blowdown, the vapor and its heat being recovered. The operator merely adjusts evaporator blowdown to hold constant level in the evaporator. In this manner, we may recover both the water and the heat associated with boiler blowdown.

In installations where plant load undergoes several daily changes, the required evaporated water makeup rate may vary considerably during operation. In practice, several arrangements are possible to provide for flexible evaporator operation with respect to variations in load.

In most cases, the evaporator vapor passes directly to the boiler feed tank. In newer plants which do not employ a boiler feed tank, the evaporator vapor passes either to a low pressure heater or to a vapor condenser. The evaporator coil may be drained to a low pressure heater or direct to the boiler feed tank.

When a comparatively small evaporated water makeup rate is desired, draining the evaporator coil to a low pressure heater is desirable since the evaporator coil steam pressure may become too low to overcome the static head to the boiler feed tank. At higher evaporated water makeup rates, with the attendant increase in evaporator coil steam pressure, the evaporator coil may be drained direct to the boiler feed tank. In general, the evaporator coil may be drained to the shell side of any appropriate heater; provided that the evaporator coil steam pressure exceeds the static head to the heater shell pressure, by an amount sufficient to induce continuous drainage of the coil.

Part 2 of this 3 article series will appear in next month's issue.



Feed Bags Sanitized by Dielectric Ovens

Dry heat produced by high-frequency power not injurious to burlap; new method sales this firm nearly one million in packaging costs.

A greatly improved process for sanitizing burlap feed bags for reuse utilizes high frequency heat, which literally "cooks" disease organisms to death. The General Electric Company manufactured the first of these dielectric ovens for bag sanitizing for installation in the Eastern States Farmers Exchange mill.

The new process will help the farmer safeguard against spreading livestock and poultry diseases through the use of used feed bags. It is comparable in its effectiveness to the pasteurization of milk.

Although a chemical process pioneered by Eastern States had long been the best of its kind, considerable improvement in bag sanitization appeared possible by using high frequency dielectric heat. Recognizing this, bacteriologists conducted a series of tests in collaboration with the General Electric Company to prove the effectiveness of dielectric heat for sanitizing burlap bags.

neat for sanitizing buriap bags.

These tests showed that while high-frequency power in itself has no lethal effect on the bacteria, the heat, which is generated by the process, destroys common disease-producing organisms.

Equipment

The dielectric sanitizing ovens are approximately 60 ft long and each is rated at 60,000 watts. High

frequency energy of 13 million cycles per second heats the 250 bag bales uniformly throughout. In this respect the heating principle of the dielectric ovens is entirely different from the ordinary hot air oven, which heats from "outside-in".

air oven, which heats from "outside-in".

The dielectric heating process has no apparent detrimental effect on the life or soundness of burlap. Some of the chemicals tried in the quest for better or more economical sanitizing methods, on the other hand, have damaged burlap. Steam, too, because it moistens the fibers, was also found to be destructive. But saturation with dry heat produced by high-frequency power is not injurious.

Economy

Reuse of feed bags is by no means a small item in Eastern States service. The mill uses 50,000 bags a day. Once in service, each feed bag, by making repeated trips, carries 500 to 800 lb of feed to the farms. This used-bag program makes the cost of packaging 100 pounds of feed about six cents. In other words, the program of reusing bags makes the cost of packaging feeds considerably less than it would be if feed were shipped in new bags. Conservatively, the used-bag program saves Eastern States farmer members approximately one million dollars each year in packaging cost.

UNCLE SAM - BUSINESS COMPETITOR

No. 4 in a series of editorial messages

NE of the long-range objectives of socialism is government ownership and operation of the means of production—or, in other words, nationalization of industry.

From that viewpoint it may seem that socialism has not gained much of a foothold in the United States. For as we look about we note that those business enterprises with which we are most familiar—the local stores and factories—still seem to be operating much the same as ever. They are still under private ownership and control. Though burdened with heavy taxes and hampered by govern-

mental regulations, they are still a part of our free enterprise system.

Yet, our genial Uncle Sam, usually characterized as a be-whiskered old gentleman who exercises a benevolent supervision over the destinies of the nation, is rapidly becoming a sort of "meddlesome Mattie" whose grasping fingers are acquiring direct control over much of the business and industry of this country.

The report of the Hoover com-

mission, a bi-partisan group of business and governmental experts who spent nearly two years in detailed study of ways and means of bringing greater efficiency into operation of the Federal Government, devotes much critical attention to the more than 100 different business activities now conducted by the Government. Among these are the production, distribution and sale of electric power and fertilizer; operating ships and railways; lending money, guaranteeing loans, writing insurance; buying and selling farm products, and smelting and selling minerals.

In these various business enterprises the Federal Government now has direct investments of some \$20 billion, with additional authorized commitments of \$14 billion; and with vastly greater commitments in the form of guarantees on deposits and mortgages and in government life insurance. And in most of these varied activities the Government is in direct competition with private business enterprises.

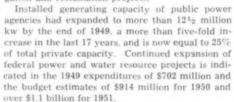
No private financial institution can compete with the Government in lending money. For government can lend at lower rates and need not be so careful about security or collateral, since the losses on its loans will be underwritten by the taxpayers —and have been, in some recent widely publicized RFC cases.

Among the several governmental agencies now making direct loans to individuals and companies are the Federal Reserve Banks, the Farmers' Home Administration and the RFC. The latter, originally set up strictly as an emergency organization to help

battle the depression of the early 30's, has been continued through years of prosperity; though obviously, as was pointed out by the Hoover Commission, any direct-lending activities by government may lead to waste, favoritism, political pressure, or corruption.

In the field of electric power development the Federal Government has become a major factor; and this development is no longer disguised as merely incidental to flood control, navi-

gation and reclamation projects.



In such fields as public housing, government lending, and federal power production are notable examples of the strides which government is likely to take, once it starts in any field of business activity.

It's easy to start—but difficult to stop, or curb. For these federal programs mean a continued flow of easy money, more jobs to pass out, more power for federal officials. But they also mean increased federal deficits, more government competition, and a continued trend toward a socialistic state.





This easy-to-file reference data on electronic circuits will help the plant engineer to adapt electronic equipment to actual and potential industrial applications. Such equipment is neither mysterious nor complicated. Adaptability and simplicity of operation and maintenance makes electronic controls practical and efficient plant tools.



Radia Curp. of America

THE VACUUM TUBE AND THE MOTOR-OPERAT-ED RHEOSTAT, ALTHOUGH UNLIKE IN APPEAR-ANCE, SERVE THE SAME FURPOSE BY CHANGING THE RESISTANCE OF THE CIRCUIT AS DETER-SINED BY EXTERNAL CONTROL MEANS.

Electronic Circuits



Cather-Hommers, Inc.

for the Plant Engineer

Circuits containing electronic tubes may be analyzed by using the same fundamental principles employed for other power circuits.

By W. C. Scaley*

THE reason for the common differences in approach to electronic and other power circuits is historical rather than that due to fundamental differences in the circuits themselves.

By way of simplification, the three typical types of electronic tubes commonly used as circuit elements are:

- Two-element rectifier tubes
 Three-element gas-filled rec-
- tifier tubes
 3. Three-element vacuum tubes

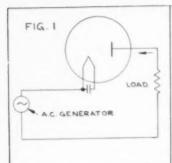
Grasping the characteristics and

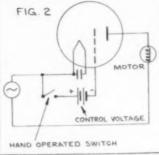
functions of each of these constitutes a primary step towards practical appreciation of electronic circuits.

Two-Element Rectifier Tubes

A two-element rectifier tube has two active part: a heated cathode usually in the form of a filament, which can emit electrons readily, and a metal plate. The filament is usually heated by circulating cur-

^{*}Luginers in charge of transformer design, The Allis-Chalmers Mfg. Co.





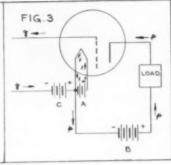


FIG. 1. TYPICAL CIRCUIT FOR A TWO-ELEMENT VACUUM TUBE.

FIG. 2. TYPICAL CIRCUIT FOR A THREE-ELEMENT GAS-FILLED TUBE.

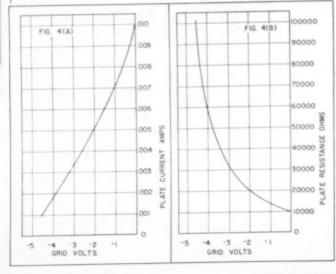
FIG. 3. TYPICAL CIRCUIT FOR A THREE-ELEMENT VACUUM TUBE.

rent through it from the plate, which is not heated. This type of tube will conduct current through it from the plate to the filament but will allow only a negligible amount of current to flow in the reverse direction. As a circuit element, its action is approximately the same as that of a copper oxide rectifier. A circuit employing a tube of this sort is shown in Fig. 1. In this application, the tube permits current to flow only when the voltage across the tube is in

the direction of the arrow. Current does not flow when voltage is in the reverse direction. A twoelement rectifier tube can be used to convert a-c power to d-c power in this manner.

Since they readily conduct current in one direction and will allow only a negligible amount of current to flow in the other direction, all the common electronic tubes act as rectifiers in addition to any other function they perform.

Fig. 4. The curve at left shows how the plate current through the load varies as the grid voltage is changed in the circuit of Fig. 3. The curve at right shows how resistance from the plate to the filament of the vacuum tube varies as the grid voltage is changed in the circuit of Fig. 3.



Three-Element Rectifier Tubes

Three-element gas-filled rectifier tubes are like two-element rectifier tubes plus a third element the grid, which is located in the space between the plate and the filament and is insulated from both. In operation, an external voltage is applied between the grid and the filament so that grid has a negative potential with respect to the filament. As long as the grid is at a sufficiently great negative potential with respect to the filament, current flow from the plate to the filament is prevented. Value of this external potential may be reduced to permit current to flow through the tube from the plate to the filament at any desired instant of time.

A three-element gas-filled rectifier tube either completely blocks the flow of current or permits full current to flow by offering negligible impedance in the circuit. The condition of operation depends upon the grid potential and the voltage applied between the plate and the filament. Once a flow of current is started, the current cannot be interrupted by the grid. If, however, the current through the tube is reduced to practically zero by external means, the grid can prevent further flow provided the proper negative potential is applied to it.

A circuit containing a threeelement rectifier tube, or Thyratron, is shown in Fig. 2. A threeelement rectifier tube really acts like a switch which can be operated quickly by a small amount of electrical energy. In the circuit shown, the tube acts as a switch and either supplies power to the motor or interrupts the motor circuit, depending upon the control voltage applied to the grid.

Three-Element Vacuum Tubes

The third type of electronic tube is the three-element vacuum tube, which is more diversified in application than the others. A vacuum tube has a heated cathode, a grid and a plate, the same as a three-element rectifier tube, but the space inside the tube instead of being filled with a gas is almost a complete vacuum.

As a circuit element, a vacuum tube acts exactly like an adjustable resistor in series with a rectifier. The resistance measured from the plate to the filament can be adjusted over a wide range by controlling the potential of the grid with respect to the filament.

The current through a vacuum tube and the voltage across it from plate to filament are in phase in exactly the same manner as they would be in any resistor. Current flowing through the resistance of the tube produces a loss in the form of heat in the tube, corresponding exactly to the action which occurs in resistors. A solenoid operated rheostat could be substituted for a vacuum tube in most electronic circuits to give the same performance if it responded quickly enough on the available energy.

The principal advantage of vacuum tubes over other forms of adjustable resistors are the wide range over which the resistance can be varied, no moving parts, quickness of response, and the small amount of energy required for controlling the value of the resistance.

Fig. 3 shows the basic circuit used with vacuum tubes. This circuit may be divided into three practically independent circuits, namely, filament, grid and plate circuits. Purpose of the filament circuit, indicated by the arrows marked f in the figure is to permit current to flow to heat the filament so it will emit electrons in the desired quantity. An acsource is often used instead of battery A.

Load current of the tube is carried by the plate circuit, indicated by the arrows marked p in Fig. 3. The voltage of battery B causes the load current to flow through the impedance of the load and the resistance of the tube.

The grid circuit, indicated by the arrows marked g, carries only an extremely small current because of the high impedance in the tube between the grid and the filament, especially when the grld is maintained at a negative potential with respect to the filament. By use of the grid circuit, the resistance of the tube is adjusted to the desired value, by adjusting the voltage between the grid and the filament. The function of battery C, when used, is to aid in adjusting voltage between the grid and the filament.

Varying the Plate Resistance

Adjusting the grid voltage to vary the resistance of the plate circuit is shown in the following example in which the circuit elements of Fig. 3 have the following values of voltage and resistance:

Battery A—Normal voltage six volts Battery B—100 volts Battery C—Zero volts Load resistance—Zero ohms

Under these conditions the current in the load circuit is represented by the curve at left in Fig. 4, where the plate current is plotted against grid voltage. Note that for each value of grid voltage, the plate current has a definite value. This curve shows how the plate current can be varied by adjusting the grid voltage to adjust the tube resistance.

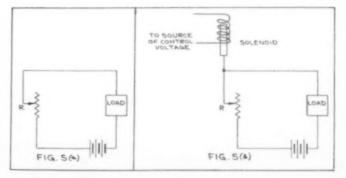
Since the tube is the only resistance in the plate circuit, the resistance of the tube under these conditions is equal to the voltage causing the current to flow (100 volts) divided by the current. By calculating the resistance corresponding to each value of grid voltage the curve at right in Fig. 4 is obtained. This curve shows how the resistance of the tube can be varied by adjusting the value of the grid voltage.

From these curves it is evident that if the voltage applied to the grid is varied rapidly, the current in the plate circuit will vary correspondingly. If a-c voltage is applied to the grid, the current in the plate circuit will be d-c with an a-c component, produced by the varying resistance in the plate circuit.

Rheostat Also Varies Current

The action of a variable resistance in varying the current in a circuit will be shown by using the circuit shown at left in Fig. 5, which is similar to that of Fig. 3. A manually operated rheostat has been substituted for the vacuum tube. The current through the load depends upon the position of the rheostat arm R and can be changed at any desired rate subject only to the limitations of the resistance and the speed with which the arm can be moved. By

Fig. 5. The current through the load may be varied by abjusting the position of the riegstat arm R shown at left; or by abjusting the voltage across the solenoid shown at right, which in turn changes the position of the rhostat arm R.



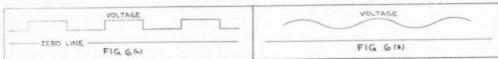


Fig. 6. These curves show the voltage variation which can be produced by varying the circuit resistance in the circuits of Figs. 3 or 5.

moving the arm up and down, a pulsating direct current through the load and a pulsating d-c voltage across it can be produced. The shape of the voltage wave (with time) across the load will depend upon the movement of the arm. If the arm is moved quickly with longer rest periods in between movements, a voltage across the load like that at left in Fig. 6 can be produced. By continuous movement at the proper rate, a curve shown at right in Fig. 6 can be produced. By proper motion, almost any desired shape of voltage wave can be obtained.

If the rheostat of Fig. 5a is provided with a solenoid operator, as in Fig. 5b, its resistance can be adjusted electrically. A properly designed rheostat can replace a vacuum tube in some circuits. where it will operate exactly like the vacuum tube it replaces. No filament circuit is required in this arrangement. The solenoid circuit is connected to the source of control voltage just like the grid circuit of the tube. The variable resistance is connected to battery B and the load just like the plate circuit of the tube. In his manner, identical circuit characteristics can be secured from both devices, since both are adjustable resist-

The resistance of a solenoidoperated rheostat, where the resistance wire changes its resistance with the current carried because of the change in temperature produced, depends upon two factors: the voltage applied to the solenoid, and the current carried by the rheostat.

Similarly, the resistance of the plate circuit of a vacuum tube operating under normal conditions depends upon the voltage applied between grid and filament, and the current in the plate circuit.

Curves showing the variation in plate resistance with the grid voltage and the plate current are shown in Fig. 7. The plate voltage may be used as one of the factors instead of the resistance since the plate voltage is equal to the product of the resistance and the plate current. The same information as contained in the curves of Fig. 7 is shown by curves in Figs. 8, 9 and 10 in slightly different form, with different variables on the axes. Curves such as these are sometimes called the characteristic curves of a tube, since they depend only on the design of the tube.

Characteristic curves such as these can be obtained by using the circuit of Fig. 3 with means for adjusting the control voltage. the voltage of battery B, substituting an ammeter for the load and providing suitable voltmeters for measuring the control voltage and the plate voltage. As long as the grid voltage is negative with respect to the filament, only negligible current flows from the grid to the filament, and the curves in Figs. 7 to 10 apply. This is the most common condition of circuit operation. However, if the circuit operates with the grid positive with respect to the filament, additional curves showing the effect of grid current are desirable. They may be obtained in similar man-

Current-Voltage Relation

Three procedures commonly used to determine the current and voltage relations in electric circuits, including those containing electronic circuit elements, are:

- By setting up the actual circuit and measuring the currents and voltages of the circuit with electrical measuring instruments. This is the quickest and most economical procedure in many cases, especially when small amounts of power are involved, as is frequently the case with electronic circuits.
- 2. By graphical solution using the characteristic curves and

the other circuit constants. This method is used infrequently for power circuits unless they contain circuit elements with varying impedance such as non-linear resistors or vacuum tubes. For such circuits this procedure is most advantageous where one is interested only in the d-c components of currents and voltages in the circuit.

The determination of the a-c components of currents and voltage by this method may become extremely complicated and laborious.

analytical mather atical 3. By methods in connection with the usual laws of electric circuits. Such methods often use equivalent circuits to simplify the analysis. A mathematical expression may be derived to represent the characteristic curves of non-linear circuit elements such as vacuum tubes. This mathematical expression may be used in connection with the common laws governing current and voltage relations in electric circuits. The most usual equation for vacuum tube has the form:

> E = V + IR + K Eg where: E is the plate voltage V is a constant I is the plate current R is a constant K is a constant Eg is the grid voltage.

All three of these methods will produce the same results except for errors in the calculations or measurements or assumptions made in the course of the calculations. The method logically chosen for any particular case is the method which secures the desired information with the least effort.

The first method, that of setting up the actual circuit and measur-

ing the currents and voltages requires no further explanation. An example of the use of the second and third method will be described in connection with Fig. 13, which is the circuit of Fig. 3 with values for the various parts of the circuit as indicated. A graphical solution will be shown first.

The characteristic curves of the tube have been redrawn in Fig. 11 to be exactly the same as those of Fig. 9. A graphical solution for the output voltage (voltage between the plate and the filament can be obtained by drawing a line representing the equation: "voltage from plate to filament = Battery B voltage — the load resistance × the plate current = 200 — 5,000 I or E = 200 — 5,000 I."

The graph of this line is marked A in the figure. The intersection of this line with the characteristic curve marked with the value of grid voltage represents the voltage between plate and filament under these conditions and also the current flowing.

For example, a grid voltage of 2 volts corresponds to a load voltage of 145 volts and a plate current of .011 amperes; a grid voltage of 8 volts corresponds to a load voltage of 187 volts and a plate current of .0028 amperes.

This circuit obviously acts to amplify the applied d-c voltage since the variation of grid voltage from 2 to 8 volts produces a variation in the plate voltage of from 145 to 187 volts and a variation of from 55 to 13 volts across the resistor.

In this example the curves have been used to obtain a graphical solution of the current and voltage relations of a circuit directly corresponding to different values of grid voltage.

An analytical solution for the current and voltage relations of the circuit of Fig. 13 may be obtained by first deriving an equation which will represent the characteristic curves over the range of voltages for which the tube is to operate for the application. Since the equation previously mentioned (E = V + IR + KEg) is the equation of a straight line, the curves of Figs. 7, 8, 9, and 10 must be straight lines if the equation is to apply.

By inspection of the figures it is readily apparent that although the curves of Figs 7 and 10 are practically straight lines over most of the range, the curves of Figs. 8 and 9 are not. However, if the range selected for operation is sufficiently small, straight lines can be drawn for the portions of Figs. 8 and 9 over which the tube is to be operated.

In many cases, sufficiently close approximation may be obtained by drawing such straight lines. While more complicated equations can be used to secure a closer approximation than is possible by the use of the simple equation given, such more complicated equations are difficult to use and wherever possible use is made of the linear equation.

Values for the constants V, R and K of this equation can be determined by substituting from the curves for the range considered, in the equation, thus obtaining three simultaneous equations which are solved for the constants in the following manner.

The following tabulation of values is made from the curves of Fig. 10.

E	Ip	Eg
70	.006	0
225	.006	8
275	.012	8

Substituting these values in the equation E = V + IpR + KEg results in the following three equations:

$$70 = V + .006R + 0$$

 $225 = V + .006R - 8 K$
 $275 = V + .012R - 8 K$

Solving these three equations simultaneously results in the following values:

$$V = 20$$
 $R = 8333$
 $K = 19.4$

or the equation which represents the tube performance over the range selected is

$$E = 20 + 8333 \text{ Ip} + 19.4 \text{ Eg}$$

In order to obtain a physical conception of the action of the tube as a circuit element, the equation E = V + IR + KEg or the equation derived above may be interpreted in the form of an

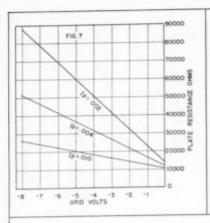
equivalent circuit as follows: The overall effect of the vacuum tube on the circuit is that of a variable resistor. Since the resistance of the vacuum tube varies in a complex manner as described by the equation, the individual terms of the equation may each be considered separately to determine what kind of a device would behave in the manner described by the equation.

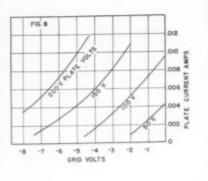
A battery or a d-c generator could produce the constant voltage V represented by the first term of the right hand side of the equation. The voltage represented by the term IR would be produced most easily by the load current flowing through a constant fixed resistor. The voltage KEg could be produced by a separately excited d-c generator, the field of which was excited by the voltage Eg; or by an adjustable rheostat the motor of which was suitably controlled by the voltage Eg: or by some kind of voltage transforming device which produced a voltage in the circuit proportional to the voltage Eg applied to it.

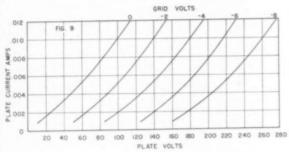
Since the purpose of choosing the device is merely to obtain a physical picture, an arbitrary selection of the device can be used for an equivalent circuit. If we take a battery, a resistance and a separately excited d-c generator as substitutes for the vacuum tube as a circuit element we obtain the equivalent circuit of Fig. 15 to represent the tube connected as shown in Fig. 3.

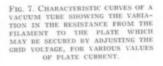
As an alternative to using a separately excited d-c generator to represent the voltage KEg, this voltage may be considered as being produced by a voltage transforming device which differs from a transformer in that the currents in the two windings are independent of each other and the fact that it will transform d-c just as faithfully as a-c.

Because of their resemblance to physical quantities in the equivalent circuit, the resistance R is sometimes called the plate resistance, and the constant K is frequently referred to as the amplification factor, since the voltage applied to the grid appears in the plate circuit as the grid voltage multiplied by the factor K.









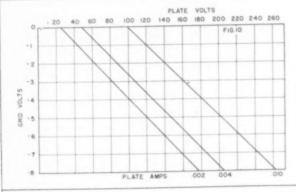


FIG. 8. CHARACTERISTIC CURVES OF A VACUUM TUBE SHOWING THE RELATION BETWEEN GRID VOLTAGE AND PLATE CURRENT FOR VARIOUS VALUES OF PLATE VOLTAGE.





A VACUUM TUBE SHOWING RELATION BETWEEN PLATE VOLTAGE AND GRID VOLTAGE FOR VARIOUS VALUES OF

PLATE CURRENT.

FIG. 9. CHARACTERISTIC CURVES OF A VACUUM TUBE SHOWING THE RELA-

Fig. 11. The intersection of the straight line with the characteristic curves of a tube gives a graphical solution of the current and voltage relations in the circuit of Fig. 13.

O12 FIG. II

O10 ST PIG. III

O10 ST PIG

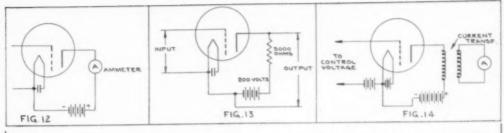


Fig. 12. Electronic voltmeter. Ammeter A indicates voltage applied between grid and filament.

Fig. 13. Example of a vacuum tube circuit showing typical values of the circuit contacts.

FIG. 14. CURRENT TRANSFORMER PERMITS ONLY THE A-C COMPONENT OF THE CURRENT TO FLOW THROUGH AMMETER ENABLING THE CIRCUIT TO FUNCTION AS AN A-C VOLTMETER.

From an inspection of this circuit we note that if the voltage Eg is a d-c voltage, the voltage across the terminals of the generator will be d-c. If the voltage Eg is an a-c voltage, the voltage Ep across the terminals of the generator will be a-c.

The equivalent circuit of Fig. 15 may be used to determine the performance for the circuits having the constants of Fig. 13 in the following manner:

The values for the voltage and resistances of the circuit are placed on Fig. 15.

The resistance of the circuit = 8333 + 6000 = 13333 ohms. The voltage acting around the circuit = 200 - 20 - Eg \times 19.4.

Current in circuit = I =
$$\frac{180 - 19.4 \text{ Eg}}{R}$$

= $\frac{13333}{When \text{ Eg}} = 2; I = 180 - 19.4 \times 2$
= $\frac{13333}{13333} = \frac{13333}{0.0106 \text{ amps.}}$

Plate voltage $= 200 - .0106 \times 5000 = 147$ volts compared to the value obtained graphically of 145 volts.

When Eg = 8; I = 180
$$-$$

 $\frac{19.4 \times 8}{13333} = \frac{24.8}{13333}$
= .00187

Plate voltage = 200 - .00187 \times 5000 = 191 volts compared to the value obtained graphically of 187 volts.

If the equations had been restricted to a smaller range, the check obtained between the graphical and analytical solutions would have been closer. If a closer check is desired between the graphical solution and the analytical solution an equation covering a shorter range of the curves could be derived in a similar manner using values from a smaller range.

The advantage of equivalent circuits of this kind is that it permits the operation of the tube of a circuit element to be interpreted in terms commonly used for power circuits.

Various results can be obtained for various grid connections in electronic circuits, just as with any motor operated rheostat various results can be gotten by different arrangements of the control circuits. A motor-operated field rheostat for a d-c generator can be controlled to regulate for constant circuit voltage, for constant circuit current or to regulate the temperature of a resistor connected in the circuit or to control a wide variety of other factors. By varying its speed of response it can be made to overshoot and hunt and produce a pulsating voltage at the terminals of the generator. A similar variety of results can be accomplished with three-element vacuum tubes using suitable control circuit connections.

Sometimes extremely complicated control circuits are used with

vacuum tubes in order to secure desired results. In any case, the curves and the equations are merely means of expressing the variation of the resistance to the vacuum tube as a circuit element with variations in the plate current and grid voltage.

The basic circuit of Fig. 3 can be used either alone or in. combination with other circuit elements for a variety of uses, such as, a d-c vacuum tube voltmeter, an a-c vacuum tube voltmeter, amplifier circuits, oscillator circuits, modulator circuits, detector or demodulator circuits. The desired results can be secured by varying the quantitative values of the different parts of the circuit, the kind of vacuum tube used and the way the basic circuit is connected to other electric circuits.

D-C Vacuum Tube Voltmeter

The basic circuit of Fig. 3 can be used as a d-c vacuum tube voltmeter by making the load an ammeter as shown in Fig. 12. If the circuit elements have the same values as used for constructing Fig. 4a, Fig. 12 will indicate the current flowing corresponding to any value of d-c voltage applied between grid and filament. The curve of Fig. 4a may be used as a calibration curve to determine the voltage between grid and filament for a given ammeter reading. If desired, the ammeter may be marked in volts using Fig. 4a as a calibration curve. An electronic voltmeter will measure d-c volt-

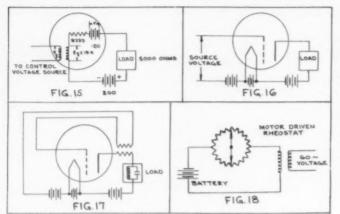


FIG. 15. AS A CIRCUIT ELEMENT A VACUUM TUBE FUNCTIONS AS IF IT CONSISTED OF A BATTERY IN SERIES WITH A RESISTANCE AND A VOLTAGE SOURCE WHICH IS PROPORTIONAL TO THE CONTROL VOLTAGE.

Fig. 16. When an alternating voltage is applied as a source voltage to this vacuum tube circuit the load current will contain a natifenating current compound.

Fig. 17. A circuit which produces an alternating current component in the load current by feeding a small amount of the A-C power from the plate circuit back to the grid circuit.

Fig. 18. A motor-driven rheostat in series with a battery can be used as a source of 60-cycle a-c power. The transformer separates the 60-cycle voltage from the d-c voltage across the coil.

ages with only extremely minute current drain on the voltage source. Fundamentally the circuit of Fig. 3 may be used as an electronic voltmeter because for each value of grid voltage the resistance of the tube has a different ohmic value so that the current in the plate circuit will vary as the grid voltage is varied.

D-C Amplifiers

The basic circuit of Fig. 3 can be used as a d-c amplifier as shown in Fig. 13. A numerical example has been previously given showing the operation of this circuit as a d-c amplifier and how with a variation of grid voltage from two volts to eight volts a variation in the plate voltage from 145 volts to 187 volts can be obtained.

A-C Voltmeter

The basic circuit of Fig. 3 may be used with an a-c voltmeter to measure only the a-c component of an applied voltage either by using the circuit of Fig. 12 and replacing the d-c ammeter with an induction type ammeter, or by using any a-c ammeter in the circuit of Fig. 14 in the secondary of the current transformer. The value of the current flowing at every instant in the ammeter can be determined by the graphical means used for the d-c voltmeter. It can also be determined by analytical means. If the circuit contains inductance as a circuit element the analytical method is by far the more convenient. For a circuit such as Fig. 14 in many cases the only interest is in the a-c component and voltage in the circuit. If the voltage Eg is an a-c voltage, it may be sufficient to calculate only the voltages in the circuit due to the voltage KEg produced by the voltage transforming device.

A-C Amplifier

The circuit of Fig. 3 can be used

as an a-c voltage amplifier by selecting the correct values for the circuit element as in Fig. 13. If an a-c voltage of six volts is applied as a source voltage, an a-c voltage of approximately 42 volts will appear across the load, in addition to the d-c voltage.

Where the amplification afforded by one tube is insufficient, a tube giving greater amplification can be selected or the voltage across the load can be applied either directly or through a transformer to another amplifier having the same circuit as Fig. 13.

Oscillator Circuits

If the control voltage is supplied from a fixed frequency a-c source, as by a vibrating crystal generating an emf or other source of a-c, the circuit of Fig. 16 can be used as a source or generator of alternating current. It acts as an a-c generator only when a-c is applied to the grid. The a-c used for the control voltage can be obtained from the plate circuit by feeding a small amount of the a-c power in the plate circuit back to the grid circuit as in Fig. 17. Such a circuit is called an oscillator circuit. In oscillator circuits the vacuum tube acts as a variable resistor in a d-c circuit to produce a pulsating d-c voltage across the load. This pulsating d-c voltage has both a-c and d-c components. but the one desired is usually the a-c component.

Sixty-cycle power could be produced in similar way by means of a d-c source and a motor-driven rheostat as shown in Fig. 18 but such a circuit is not used practically because a conventional a-c generator has more desirable operating characteristics.

Many Variations

In all the applications described, the function of the vacuum tube has been that of a variable resistor. The complications of the circuits have been for the purpose of securing the desired control of the grid voltage. In practice, further complications are frequently utilized in order to produce the desired resistance changes in the plate circuit of the tube in its function as a conventionally variable resistor.

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Texas Plant Cuts Handling Cost

Fleet of nine fork lift trucks has streamlined dock, warehouse, and railroad siding materials handling operations for The Imperial Sugar Co.

Francis A. Westbrook

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It is necessary to load the 330 lb bags of raw sugar into box cars for

a boatload arrives, the surplus is stacked in the company warehouse. Maximum efficiency of refinery operation requires the delivery of seventeen carloads per day.

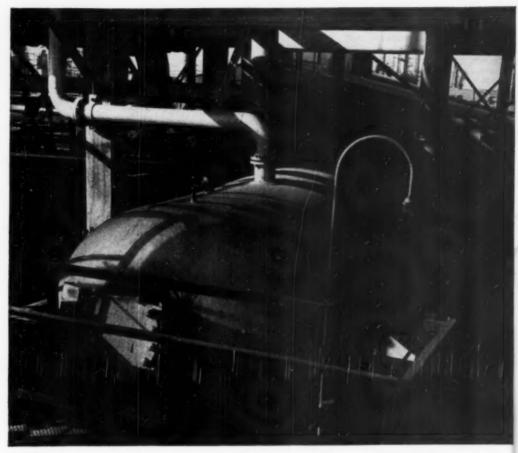
Substitution of mechanical for

This is a typical warehouse operation at Imperial Sugar. At the left, three men are handling one bag of sugar. Two of them are using bale hooks, which if improperly applied are likely to damage the bag. Mechanization at the right shows one man with a fork truck handling six bags of raw CANE SUGAR AT A TIME, TOTALING 1980 LB.





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the old manual methods has materially reduced materials handling costs in the dock, warehouse, and railroad siding operations. A fleet of nine gasoline powered fork lift trucks was placed in operation, each equipped with an unloading accessory, which mechanically pushes a load of bags off the lift

One man operating one of these trucks can handle six bags at a time, totaling almost one ton in weight. Sometimes the trucks must cross ramps spanning the space between cars on parallel tracks in order to load the desired cars. As the trucks are easily maneuvered

in close quarters, there is no trouble in placing the loads so as to fill the car and stack it to the top, if necessary. The unloader attachment on the truck makes it a simple matter to push the bags off the lift forks and on top of those already in place. This is much more efficient and less likely to subject the workers to injury.

Warehouse

Bags which are to be stored in the warehouse are handled by the fork lift trucks in the same way, except that they are now stacked nine high by the one man and his machine. With manual handling it was not possible to stack the bags more than three to five high, using several men. Mechanical handling has increased the warehouse storage capacity by at least 50 per cent, due to the utilization of previously wasted overhead space.

In some instances, bags are taken directly from the dock to the freight cars. But the vast majority of bags are first stored and then taken to the cars from the warehouse. In either case they are handled and transported by the gasoline-powered fork lift trucks.

Illustrations of these materials handling methods were furnished by the Towmotor Corporation.

Gas Turbine Combustor Trends

K. L. Ricke and

A. E. Hershev

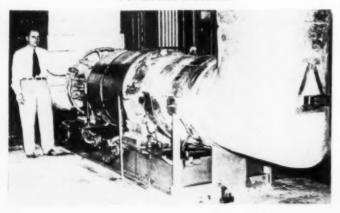
Westinghouse Electric Corporation*

This is an abridgement of a paper presented at the ASME semi-annual meeting in St. Louis, June 19-23, reporting on research into the problems associated with the combustion of natural gas in a gas turbine. The findings are significant as they demonstrate that either a liquid or gaseous fuel may be burned satisfactorily in the same flame tube, providing correct fuel and air distribution are estabflame tube, providing correct lished in the combustion zone.

fy the Westinghouse 2000 hp experimental gas turbine unit,

THEN it was decided to modi- which has been under test since August 1946, the problems associated with the combustion of

FIG. 1. GAS TURBINE DRIVEN PIPE-LINE BOOSTER INSTALLATION AT WIL-MER, ARKANSAS. THIS IS THE SAME TURBINE THAT IS DESCRIBED IN THE ARTICLE THAT APPEARED IN THE NOVEMBER 1949 ISSUE OF SOUTHERN POWER AND INDUSTRY



natural gas in such a unit were relatively unexplored. This paper reviews the test and development work which has been carried out at the Combustion Laboratory at East Pittsburgh, in order to provide a satisfactory combustor design for this gas turbine. Fig. 1 is a photograph of the unit while in operation at the Wilmar, Arkansas, pumping station of the Mississippi River Fuel Corporation.

Combustion of Gaseous Fuel

Industrial combustion equipment using gaseous fuel may be divided into two broad classifications de-

*Mr. A. E. Hershey is advisory engineer, Combustion Laboratory, Mechanics Depart-ment and Mr. K. L. Rieke is an engineer in the Combustion Laboratory, Mechanics Department. As indicated in the paper, the Mechanics Department is a part of the Research Laboratories.



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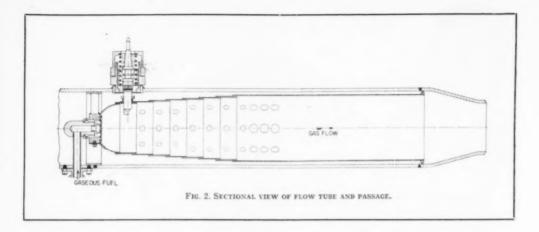
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pending on the manner in which the fuel gas and the oxygen supply are introduced into the combustion zone. In the one type the fuel and oxygen are allowed to mix and burn more or less simultaneously what is known as a diffusion flame, while in the other the fuel and oxygen, in varying proportions, are mixed before entering the combustion zone. Depending on the application, each type of flame has certain advantages and disadvantages. However, from the standpoint of the reaction rate, the principal difference between the two types of flame is that, in the case of the diffusion flame, the combustion rate is determined by the rate of gas mixing, while with the premixed flame, the rate is one which is characteristic of the fuel, air-fuel ratio and the state of the combustible mixture.

Liquid Fuels

During the early stages of the combustor development, while the full scale test passage and the equipment for the high pressure gas supply were being installed, some work was done with small scale gas mixers and flame tubes for burning premixed combustible. However, by the time the gas storage equipment and test passage were ready for full scale operation, an improved flame tube for burning distillate fuels was available, and several preliminary tests, with a single orifice gas nozzle showed that mixing and burning the gaseous fuel in the combustion

zone was a definite possibility. This was particularly attractive when it became apparent that, with multiple orifice gas nozzles, it would be possible to attain satisfactory performance burning the gaseous fuel in the same flame tube used for burning fuel oil.

Flame Tube Design

The final flame tube design is shown in Fig. 2, and with this tube the design problem was reduced to that of obtaining a gaseous fuel distribution which was similar to the distribution of liquid fuel from a swirl-type fuel atomizing nozzle. The fuel distribution pattern from a multiple orifice gas nozzle is

largely determined by the direction and velocity of the jets issuing from the nozzle. The direction of the jets may be specified by two angles, one being the included angle of the jet relative to the axis of the nozzle. With constant density and mass flow of gas, the jet velocity will be a function of the number of jets and the orifice diameter. By varying these factors it was found that the completeness of combustion at conditions corresponding to full-load operation varied from 91.7 to 98.5 per cent, the flame length tending to become longer as the completeness of combustion increased.

Spark ignition with a heavy duty

FIG. 3. VIEWS OF COMBUSTOR PASSAGE, FLAME TUBE, FUEL NOZZLE, AND RETRACT-ABLE SPARK PLUG MOUNTING.



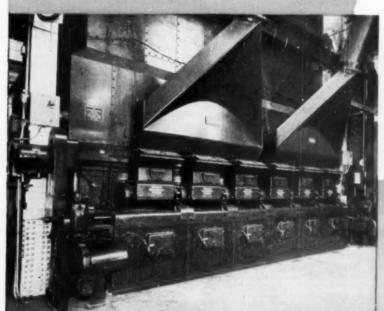
RotoGrates
Bought
Twice
For
Erie

General Electric Company twice selected Detroit RotoGrate Stokers

for their Erie, Pennsylvania, plant. First Unit —150,000 pounds. Second Unit—175,000 pounds. Both modern installations are with Bebcock and Wilcox Steam Generators.

Detroit RotoGrate is an improved spreader stoker in which grates move slowly forward, automatically discharging ash at the front. Economically burns all grades of Bituminous. Coel or Lignite. Higher burning rates produce more capacity per foot of furnace width, keeping down investments in both steem generating equipment and building. Thermal efficiency is exceptionally high . . . either with steady or fluctuating loads.

It will pay you to investigate the RotoGrate.



There is a type and size of Detroit Stoker for every Industrial and Power Need

Detroit Stokens

DETROIT STOKER COMPANY

GENERAL MOTORS BUILDING, DETROIT 2, MICHIGAN

SOUTHERN POWER & INDUSTRY for AUGUST, 1950

automotive type spark plug supplied either by means of a magneto or an ignition transformer proved to be very dependable, and prompt ignition could be obtained with any air flow up to that corresponding to half-load operation. Flame stability was such that very rapid changes of test conditions could be executed without blow out, and with full-load flow the gas rate could be reduced to give a temperature rise of 67 F with a stable flame and a completeness of combustion of 98.5%. The overall airgas ratio for this condition was 1300:1.

Satisfactory flame tube life has been achieved by providing adequate side wall cooling in the upstream end of the tube by means of the stepped sections, as shown in line drawing Fig. 2. After some preliminary operation of the pipe line booster unit with light fuel oil, the fuel was changed to natural gas and the same set of flame tubes have been in use with this fuel for all subsequent operation, amounting to some 3000 hours.

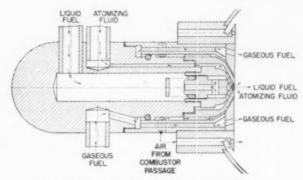


FIG. 4. COMBUSTION GASEOUS AND LIQUID FUEL NOZZLE.

At one stage in the development some difficulty was experienced with slight soot accumulation on the baffle which deflects cooling air over the inner surface of the hemispherical end of the flame tube. However, a slight change in fuel distribution subsequently corrected the difficulty in an equally satisfactory manner.

Conclusions

With the final combustor passage design, as shown in Fig. 3, the conversion of the unit from burning a liquid to a gaseous fuel can be accomplished quite readily by interchanging a set of fuel nozzles. This change can be made in about one hour. Since certain operating conditions may require an instantaneous change from one fuel to the other, the dual fuel nozzle shown in section in Fig. 4 has been developed and tested. The performance with this nozzle using distillate fuel or natural gas has been equally good. The change from one fuel to the other may be made at any operating condition. The liquid-fuel nozzle uses an auxiliary fluid to get increased atomization, and while air is normally used as the atomizing fluid, the gaseous fuel serves equally well.

The performance of the gas-turbine booster unit has provided substantial confirmation of the combustion test results obtained in the laboratory, in particular it has demonstrated that either a liquid or gaseous fuel may be burned satisfactorily in the same flame tube, providing correct fuel and air distribution are established in the combustion zone.

Further investigation of premixed combustion is being considered, since it should be possible to develop more compact combustor designs using this type of flame, though such combustors would not be likely to perform so satisfactorily with liquid fuels.



Magnetic Fluid Clutch

Although still in the laboratory stage, a magnetic-fluid clutch has been announced by General Electric Company's General Engineering and Consulting Laboratory.

Consisting of two metal cylinders, each able to rotate independently on the same axis, the clutch transmits rotary power from its source to its load. Cylinders are separated by a magnetic mixture of oil and finely-divided iron powder.

When the unit is energized, fluid instantly solidifies, making a rigid connection between the two cylinders, so that motion is transmitted through a solid connection. Power can be applied to the load and removed from it easily by the clutch operator. Degree of rigidity of the magnetic fluid can be controlled by regulating the current. Thus, the clutch can be allowed to slip if necessary.

STEAM DIVIDENDS SUPERIOR STEAM GENERATORS

The operating economies which result from Superior's higher efficiency and long-lived dependability pay real dividends to their owners. Their thermal efficiency (guaranteed to exceed 80%) insures lowest fuel costs. Their rugged, heavy-duty construction spells years of dependable, trouble-free operation.

Fuel and maintenance savings are outstanding where Superior Steam Generators have replaced older equipment . . . but the greatest dividends result where Superior Steam Generators are specified for new steam plants. For here are added to their economy of operation (1) the economy of small space, (2) the elimination of an expensive stack (for Superior's induced draft requires only a vent for the products of combustion), and (3) simplified installation resulting from Superior's complete factory assembly and wiring.

There'll never be a better time to buy a Superior Steam Generator . . . because these dividends start with the first day's operation, and every day thereafter adds its dividend.

> 17 sizes from 20 to 500 b.h.p. for pressures up to 250 p.s.i. Fully automatic with all grades of oil or gas. For complete data write for Catalog 211,

ombustion Industries, inc.



Readers are invited to send in kinks, ideas, and suggestions. Payment is made for all material accepted.

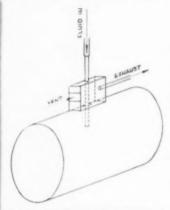
Portable Hooded Funnel for Fume Control

IN a chemical plant where carbon tetrachloride was transferred from a large pipe manifold to 55 gallon drums, workmen who were doing the filling often became ill from breathing the ariswas connected to the inlet of a centrifugal fan. This fan exhausted the carbon tetrachloride fumes and discharged into a stack extending above the roof of the building.

Air for scavenging the fumes from the filler hoods was admitted to each hood through a vent in the side, and also at the bottom where the hood rested on the rounded surface of the drum.

By the use of these vented filler hoods one operator could fill 4 drums at once without any discom-

J. R. DARNELL



ing vapors. Considerable time was lost and production slowed down.

To overcome this difficulty and at the same time permit venting of the drums while filling, the author designed a special type of hooded filler connection which could be inserted into each drum and also be connected to a manifold leading to the inlet of an exhaust fan.

Carbon tetrachloride from the pipe line was discharged through a flexible connection into a 34" pipe welded into the top of the portable hood, and long enough to extend downward about 4 inches below the shell of the hood so as to extend into the receiving drum.

Twelve of these fillers were used, each with 4 in. vent connection designed to slide into 12 ducts leading to a 14 in. header which

Shop Made Metal Shaper

COOK Metals Engineering
Co. of Houston, Texas, is
utilizing the illustrated shop
made metal shaper, which operates from power supplied by
an ordinary hydraulic truck
jack.

Framework consists of four pieces of angle iron set in concrete. A heavy channel iron beam was welded across the top and matched holes burned in the uprights at approximately 10 inch intervals. The heavy base beam has holes in the ends

to match the holes in the uprights, so that it can be raised or lowered to accommodate various work.

A large plate was fastened to the jack, and springs of sufficient capacity are provided to bring the jack back to a raised position.

Parts are formed in half of a short piece of six inch pipe, which is welded to the base, and braced with angle iron.

H. A. HESS Houston, Tex.



SOUTHERN POWER & INDUSTRY for AUGUST, 1950



There's no useless over-generation of steam, no loss in wasted heat and energy in the plant that uses Natural Gas for fuel.

For this modern fuel is easily adaptable to automatic control, holding steam generation remarkably close to the load requirements of your plant.

Furthermore, you'll realize additional savings from its clean burning qualities, and in drastically reduced maintenance and operating expense. Consult your local gas company or write to us for further information on how you may cut fuel costs to an absolute minimum by installing Natural Gas in YOUR plant!



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Converts from pulp stock handling to acid-liquor service by merely changing a few pump parts. For hot service, a water-jacketed stuffing box is easily added.

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By standardizing on these pumps, you also economize on spare parts - a small number of interchangeable parts protects a large number of pumps.

EASILY REPAIRED WITHOUT DISTURBING PIPING

Dismantling is simple. Entire bracket, rotating element and pump cover can be unbolted and lifted free from the case without disturbing suction and discharge piping.





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Quoting from their letter of October 17, 1949:

"We ran our first test on LUBRIPLATE #22 in March, 1945, in 3000 series Timken tandem-drive, worm axles. That year we experienced considerable trouble with wartime drivers and very poor roads, causing us no end of trouble. The oil that we were using set up to tar in 10 to 15 thousand miles. The LUBRIANTE #22 proved so satisfactory we installed

it in all our worm-gear, hypoid, and two speed axles. This enabled us to change our oil-change period from 15,000 miles to 40,000 and on some applications, depending on speeds and temperatures encountered, we raised the change period to 60,000 miles, or approximately once a year. Our overhaul periods were stretched from 50,000 to 100,000 miles, and repair parts bill cut 50% with the increased mileage."

Naturally with the economies that this company enjoyed through the use of LUBRIPLATE Lubricants on worm-axles, they extended the use of LUBRIPLATE to other parts of their equipment. The savings in parts, time, money and increased efficiency are equally startling. Let us send you the entire report of where they are now using LUBRIPLATE and what it is saving them.

LUBRIPLATE Lubricants will prove just as effective for you in your plant in reducing friction and wear. They are different from any other lubricants you have ever used. They save power, prevent rust and corrosion and definitely arrest progressive wear.

LUBRIPLATE Lubricants are available from the lightest fluids to the heaviest density greases. There is a LUBRIPLATE Product best for your every lubrication requirement. Let us send you CASE HISTORIES of savings that others in your industry are making through the use of LUBRIPLATE Lubricants. Write today.

LUBRIPLATE DIVISION

Fiske Brothers Refining Company Newark S, N. J. Toledo S, Ohio

DEALERS EVERYWHERE ... CONSULT YOUR CLASSIFIED TELEPHONE BOOK



Adjusting Device for Header

To align the discharge header of a high-pressure compressor so that the flanges tying it to the companion members on the three cylinders could be spotted and held in place without utilizing the flange bolts as improvised "jacks", the chief engineer of one compressor station mounted two heavy steel plates, each with a three-inch wide groove milled across it, on the concrete engine base at the ends of the niche formed to take the welded header.

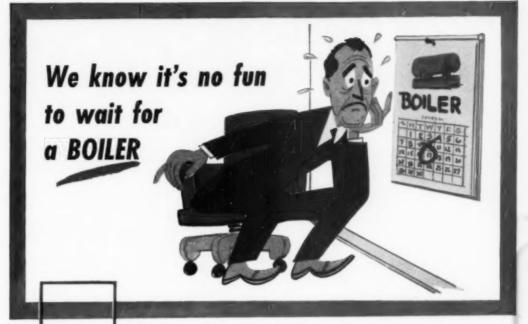


Two three-inch square steel blocks, drilled to take a 7s-in. bolt, and with the top sides bevelled to form an angle of about 30 degrees with the base, were set into the milled groove, and a long-threaded bolt put through the two holes in the matched blocks.

By tightening up on the nut of the bolt, the two sloping faces of the blocks could be brought closer together, acting as wedges to lift the heavy manifold, but permitting it to be rotated slightly if necessary to bring the flanges into proper position.

With the blocks supporting the manifold, it was easy to spot the gaskets in the flange connections. and to bring the joints tight. After completing the connection, machined saddles were slipped under the manifold onto pre-set bases. and clamps passed over the manifold to secure it against possible vibration. The two wedge blocks, once the adjusting bolt has been slacked off, were easily tapped clear of the manifold with a light hammer blow-it not being considered good practice to leave them where the relatively small area of of the wedge would bear against the steel manifold shell.

> ELTON STERRETT Houston, Texas



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Write or phone your nearest Wickes representative or get in touch with our engineers here in Saginaw.



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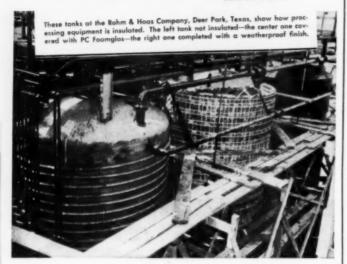
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ciency.

So light in weight that it is easily

handled, Foamglas is also rigid and strong. Being friable when subjected to point loading, it yields readily to surface irregularities, such as rivet heads and welds, thus can be pressed close to areas to be insulated without breaking or cracking. Foamglas comes in oblong blocks, in special shapes, and in pipe sections of various sizes. Special fittings can be had from the factory or can be cut and formed in the field with ordinary tools.

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When you are figuring on insulation, make sure you have the latest information on PC Foamglas. You will find it in our recently published booklet which contains descriptive text and photos of recent jobs, charts, tables, up-to-date specifications and installation instructions. Just send in the convenient coupon and you will receive promptly a sample of Foamglas and your copy of our

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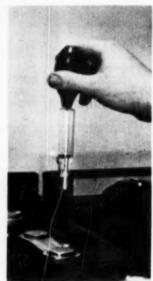
When you insulate with FOAMGLAS... the insulation lasts!

Hydrometer and Thermometer Maintenance

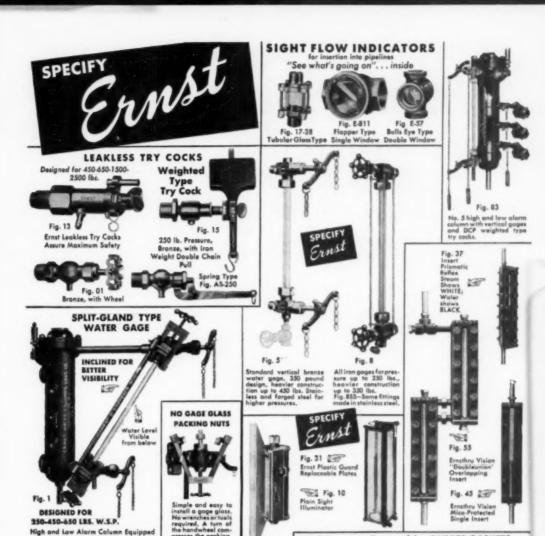
UST as the trained mechanic takes pride in caring for his tools, so should the battery-man guard the well-being of his equipment—it is an index to the type of job he performs.

Perhaps the two most important tools in the battery room are the hydrometer and thermometer. They indicate the state of charge of the battery and whether it is ready to do a day's work.

The care of the hydrometer and thermometer is simple. They should be wiped dry and returned to their assigned place after use. They should be kept clean to prevent foreign particles entering the battery. Occasionally, the hydrometer should be taken apart, the float and the inside of the barrel cleaned, and the float examined for defects.



As important as the care of this equipment, is its correct use. When using the hydrometer, the rubber nozzle is placed into the battery vent opening, and enough electrolyte drawn into the barrel to permit the float to ride freely, not touching the barrel at any point. The hydrometer is held in a vertical position, and read with the eye level at the electrolyte mark. If the hydrometer must be removed from the vent for reading.



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7:14 South New Orleans Ave., Tel. H 24-523.
WILMINGTON, DEL.: Marvin T. Rodney.
Tel. G-1138.



The doctor held his breath. An iron lung had stopped. For four years it had kept a little girl alive. Now . . . ? Feverishly, hospital attendants readied a temporary lung. But it would be only a matter of hours before substitute lung and young life would snuff out together.

Five hundred miles away in the Winsmith plant, the phone jangled with an urgent question. Could they? They'd bare to! The clock on the wall said three. Experts cooly raced the hands of the clock and at four, the gravely needed speed reducer had been assembled and flown on its way.

That night, the little patient . . . everyone breathed easier. Winsmith had won a race against time.

Unusual? Not altogether, especially when an equipment manufacturer has the foresight to install a *standard* reducer. Yes, meeting and beating tough challenges is an old Winsmith habit, thanks to standardization and management's responsiveness to customers' problems.

Your speed reducer problems may not be a maxter of life or death, but they're often a matter of profit or loss. Winsmith can help you solve these problems to your best interests . . . time-wise and cost-wise. One of the reasons . . industry's widest range of standardized types and sizes up to 85 H.P. Another . . . the large inventory of standard parts ready for quick assembly. Together, they enable the Winsmith field engineer

Handbook No. 148

engineering data.

with complete

they enable the Winsmith field engineer in your territory to prescribe to your needs right out of stock from one of these 3 basic types: the nozzle should be pinched tightly with gloved fingers to prevent dripping of electrolyte. The float scale is read at the electrolyte level, disregarding the curvature of the liquid.

Specific gravity readings must

Specific gravity readings must be corrected on the basis of plus or minus three points of gravity for each 10 degrees F (electrolyte temperature). Using 77 F as a base, three points of gravity are added for each 10 degrees above base and three points subtracted for each 10 degrees below.

This correction is necessary to obtain accurate specific gravity readings. As the temperature of the acid rises, the acid expands and is, therefore, not as dense. The float then rides low, giving readings lower than normal. Conversely, when the acid is cold, the float rides high and the reading is higher than normal. The following are examples of how this correction factor is applied.

Hydrometer	Thermometer		True
Reading	Reading	Correction	Sp. Gr.
1.250	87°P	plus 3	1.253
1.210	80°F	plus 1	1.211
1.180	64°F	minus 4	1.176

Some thermometers, specially designed for battery application, are scaled to permit ready correction of gravity readings. Adjacent to the regular temperature scale is a second column of figures, preceded by a "plus" sign above 77 F and a "minus" sign below. Reading the figures at the mercury level ascertains the amount of correction necessary. Thus, if the hydrometer reading is 1.260 and the second scale on the thermometer indicates plus 8, the true specific gravity is 1.268.

When unpacking a new hydrometer, rubber bulb, glass barrel, rubber nozzle, and float should be checked for breaks or cracks. Any dirt or packing material should be washed from the parts to prevent any foreign material from getting into the electrolyte. The large end of the rubber nozzle slips into the glass barrel, being securely held in place by tension of the rubber in the barrel. To facilitate insertion of the nozzle, the rubber and glass should be lubricated with plenty of water. The rubber bulb can be attached in the same manner.

Courtesy Gould Storage Battery Corp.



MODERATELY PRICED SMALL STEEL VALVES FROM THE COMPLETE CRANE LINE

UNION BONNET GATES...
MORE COMPACT, MORE RUGGED

Here's a valve value made possible by Crane Co.'s finer facilities for quality mass production. These low-cost, small steel gates are specially designed for a wide range of tough services. They readily withstand rough usage, piping and pressure strains, and extreme variations in temperature. The features below show how and why they do it.

- COMPACT OVERALL DESIGN—size for size, these valves are more compact than the usual high-pressure design—at no sacrifice of strength.
- TIGHT UNION BONNET JOINT—heavy steel union ring with long, precision-cut threads pulls up easily, stays tight, protects against distortion when joint is opened. Male and female bonnet joint with soft iron gasket eliminates possibility of gasket blowout.
- LEAKPROOF BODY SEAT RINGS—are securely rolled into the body. No danger of leakage around ring. Cannot loosen in service.
- FULLY GUIDED SOLID WEDGE DISC—cannot get out of line or jam in body. Disc drag and wear on seating surfaces are minimized.
- GET DESCRIPTIVE FOLDER AD-1741 for more data on these valves. Gives sizes, dimensions, and service recommendations. Ask your Crane Representative for a copy or write direct. These valves also listed in your Crane No. 49 Catalog, P. 223.

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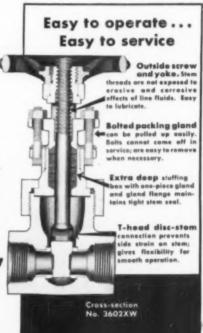
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No. 3602XW, 600-Pound Small Steel Gate for steam up to 850° F; for water, gas, air up to 500° F. Hardened stainless to Exelloy Seating. Sizes: ½ to 2-inch. Screwed or welding ends.



NEWS

FOR SOUTHERN INDUSTRY

Childers Appoints Metal Goods

CHILDERS MANUFACTURING COM-PANY, 625 Yale St., Houston 7, Texas, has appointed Metal Goods CORPORATION, St. Louis, Mo., exclusive distributor for Childers Aluminum Weather-Proof Jacketing in the Midwest and Southwest areas.

Metal Goods offices and warehouses are located in St. Louis, HOUSTON, NEW ORLEANS, DALLAS, KANSAS CITY, TULSA, and DENVER.

U. S. Steel-Port Arthur, Texas

UNITED STATES STEEL PRODUCTS COMPANY, a subsidiary of United States Steel Corporation, has announced that construction will start in the near future on a modern new steel container plant to replace facilities that were burned in 1945 at PORT ARTHUR, TEXAS.

The container plant will manufacture steel drums and pails for the petroleum, chemical, paint, food, and other industries. It will be equipped with lithographing facilities for decorating containers.

The new structure will have access to water transportation, and will include a 278 ft wharf.

Homestead Valve-Southeast

Appointment of Mr. J. W. Jones as District Sales Manager for HOME-STEAD VALVES in FLORIDA, GEORGIA, ALABAMA, TENNESSEE and MISSISSIPPI, has been announced by Homestead Valve Manufacturing Company, Coraopolis, Pa.

Mr. Jones, a graduate of the University of Kentucky, is well known in this five-state area. He has traveled the same territory for a brass manufacturing company for the past fifteen years.

Establishment of these five states as a separate sales district is Homestead's latest move in building a field organization to intensively cover the country for their lines.

Headquarters for Mr. Jones will be the James Bldg., Chattanooga, Tenn.

Chain Belt-Louisiana

CHAIN BELT COMPANY of Milwaukee has announced the appointment of GREEN'S HARDWARE & MACHINERY COMPANY of CROWLEY, LOUISIANA, as a distributor for the merchandise products of the Chain and Transmission, Baldwin-Duckworth, and the Conveyor and Process Equipment Divisions of the Company.

FUTURE EVENTS Of Engineering Interest

NATIONAL ASSOCIATION OF POW-ER ENGINEERS, A. F. Thomp-son, Sec'v. 176 W. Adams St., Chicago 33, Ill., Aug. 14-18, National Power Show, St. Louis, Mo.

NE LOUIS, MO.

HE INSTRUMENT SOCIETY OF
AMERICA, Sec'y, 921 Ridge Ave.,
Pittsburgh 12, Pa.
Sept, 18-22, Fifth National Instrument Conference and Exhibit,
Memorial Auditorium, Buffale,
N. Y.

N. T.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Sec y, 29
West 39th St., New York, N. Y.
Soyt. 25-27, New Orleans Section
1950 Conference, New Orleans,

AMERICAN PETROLEUM INSTI-TUTE, Sec 7, 50 West 50th St., New York, N. Y.

New York, N. Y.
ASSOCIATION OF IRON & STEEL
ENGINEERS, T. J. Ess, Managing Director, 1010 Empire Bldg,
Pittsburgh 22, Pa.
Sept. 36-39, Annual Convention,
Cleveland, Ablo.

AMERICAN SOCIETY FOR METALS, Wm H. Eigenman, 7301 Euclid

Wm. H. Eisenman, 7301 Etablid Ave., Cleveland, Ohio. Oct. 23-27, National Metal Congress and Exposition. International Amphitheatre, Chicago, III.

NATIONAL POWER SHOW, Interna-tional Exposition Co., Grand Cen-tral Palace, New York 17, N. Y. Nov. 27-Dec. 2, Grand Central Pal-ace, New York, N. Y.

ace, New York, N. Y.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, M. C.
Turpin, Sec'y, 40 West 40th St.,
New York 18, N. Y.
Dec. 3-6, Annual Convention, Hotel
Commodore, New York, N. Y.

Detroit Stoker Promotes Wagner

The DETROIT STOKER COMPANY, General Motors Bldg., Detroit, Mich., has announced the promotion of HER-BERT L. WAGNER to Vice-President in Charge of Engineering. Mr. Wagner will continue to be located at the Detroit Office of the company, where for some time he has been Chief Engineer.



Fisher Governor Holds Sales Meetings

Fisher Governor Company recently held a three-day international sales meeting at its home office and factory in Marshalltown, Iowa One hundred twenty-five representatives, sales

engineers and their wives from the Fisher offices throughout the United States, Canada and Mexico were in attendance as guests of the company. 1950 marks Fisher Governor Company's 70th anniversary.





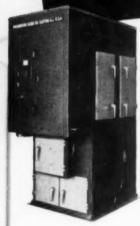
WAGNER ELECTRIC CORPORATION 6383 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS - PRANSFORMERS - INDUSTRIAL BRAKES AUTOMOTIVE REAKE SYSTEMS - AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

YOU'RE SURE YOU'RE RIGHT... WHEN YOU WEIGH FOR BATCH OR BAGGING WITH A RICHARDSON AUTOMATIC

Whatever you handle — cottonseed cake, meal, bulk peanuts, raw sugar, rice, or any lumpy, crushed or sluggish material—you're right when you weigh with Richardson Automatic Weighing Equipment.



For bulk or batch weighing try the "Class 40" Automatic Optional Feed Scale. Its features...

"CLASS 40" AUTOMATIC OPTIONAL FEED SCALE

- Accommodates either a belt, screw, or vibrating feeder.
- All controls separately housed and free from dust.
- Scale is totally enclosed.
- Reciprocating master counter automatically registers each weighing.
- · Available in three sizes:

E-40 (up to 200 lbs.) J-40 (up to 500 lbs.) M-40 (up to 1000 lbs.)

Multiple scale installations are possible with the "Class 40"... By means of a Richardson Master Control Panel, the weighing operation can be coordinated with allied equipment.

For fast and accurate bagging the "Class 38" Automatic Bagging Scale offers great flexibility in handling a wide range of materials. Its features...

- Adaptability to weighing dry, ground, non-free-flowing materials.
- Range from 50 to 225 lbs. per discharge.
- Speed from 3 to 6 bags per minute. Higher speed models available.
- Adaptability to different methods of feeding controllable at scale inlet gate.
- Bagholder to suspend bag during "en-masse" discharge; for better packing and to eliminate bag lifting by the operator.

For further information, write for Bulletin No. 1449 (Class 40) or Bulletin No. 3949 (Class 38).

RICHARDSON SCALE COMPANY
CLIFTON - NEW JERSEY
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aw York - Omeha - Bastan - Tarante
Philadelphia - Minneapells - Wichita
Heustan - San Froncisco - Mantreal



⊕ 6743

MATERIALS HANDLING BY WEIGHT

Georgia Power-Brunswick

THE GEORGIA POWER COMPANY will build a large, modern steam-electric power plant costing over \$5,000,000 at Brunswick, Georgia, as part of an extensive improvement program in that area. The announcement was made recently by C. B. McManus, president of the company, at a meeting of the Brunswick Chamber of Commerce.

Construction of the new plant's first generating unit, which will have a capacity of 30,000 kw or 40,000 hp, will start in the near future. This unit should be in operation by the middle of 1952. The plant is being designed for ultimate enlargement to four units with a total capacity of 120,000 kilowatts.

National Electric-Southeast Region

NATIONAL ELECTRIC PRODUCTS CORP., Pittsburgh, has created within its sales organization a Southeastern Region and has named Walter J. Barnes, the regional manager.

Mr. Barnes has been manager of the company's ATLANTA district sales office. In that capacity he also has supervised sales of the company's wire, conduit, cables and raceways by the New Orleans and Birmingham district sales offices, and in the state of Florida.

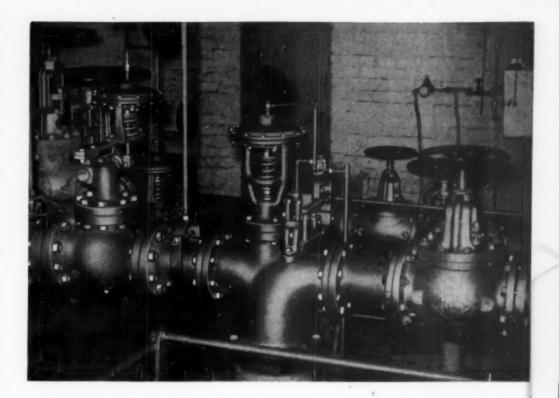
The new Southeastern region includes this territory, plus the area served by the Charlotte and Richmond district sales offices. The states of Virginia, the Carolinas, Georgia, Florida, Aladama, Mississippi, Louisiana and part of Tennessee comprise the new region.

Mr. Barnes has established regional headquarters in the National Electric office at 310 Walton Building,

Herbert E. Godfrey, Richardson Scale Pres., Dies

THE RICHARDSON SCALE Co. regrets to announce the death of its president, Mr. Herbert E. Godfrey, on June 25. Mr. Godfrey had been associated with the Richardson Scale Co. since its inception.

He was born in England where he became associated with Mr. Henry Richardson at the Avery Scale Co. Leaving England some forty-odd years ago, they came to this country and began the manufacture of automatic scales. Mr. Godfrey was secretary and sales manager of the company until 1945 when he was elected president.



Close, <u>quiet</u> control of reduced steam pressure and temperature

When it comes to your pressure reducing and desuperheating station, you will find COPES engineers talk your language. They design and size your station to give precise, noise-free control for years to come.

IN THE PICTURE . . .

COPES Pressure Reducing and Desuperheating Station handles up to 25,000 pounds of steam per hour from 450 psi and 509 F to 220 psi saturated. Pressure and temperature are held within close limits demanded for efficient operation of Pressus equipment. Thus you avoid high velocities, vibration, "chatter" and wear. Your final pressure and temperature are not upset by "hunting"—but hold within the limits you specify.

Your reducing valve has a high lift to equalize wear over more of the piston area, increasing service life. Your Desuperheater completely atomizes the cooling water, even at the lightest flows. Bulletin 477 tells the story of these accurate, *quiet* controls. Write for your copy—now.

NORTHERN EQUIPMENT CO.

803 Grove Drive, Erie, Pa.

BRANCH PLANTS: Canada, England, France, Austria, Italy. Representatives Everywhere





It tells how the Chicago Automatic Stoker meets the over-all Firing Requirements for a Wide Range of Steam Demands

ther pertinent information and typical layouts are included in this new spreader stoker bulletin now available for distribution. The Chicago Automatic with its many operating advantages and features of design is firing numerous types of boilers with variable load requirements for important commercial and industrial concerns.

For your copy of the new Chicago Stoker Bulletin, Publication No. 85, address Dept. D-12 The Standard Stoker Company, Inc. 370 Lexington Avenue, New York 17, N. Y.

THE STANDARD STOKER CO . INC .

Standard Stoker

NEW YORK · CHICAGO · ERIE · MONTREAL

A.S.M.E-1951 Officers

J. Calvin Brown, of Los Angeles, Calif., owner of the firm bearing his name in that city, has been nominated as the 1951 president of The American Society of Mechanical Engineers. Mr. Brown heads a slate of new ASME officers, including four regional vice presidents and two directors-at-large, submitted by the society's nominating committee. Since only one name is presented for each office, nomination is tantamount to election.



J. Calvin Brown

Formal election will take place in the Fall by letter ballot of the membership, which totals more than 32,000 engineers. The new officers are to begin their terms at the conclusion of the ASME annual meeting in New York next December. Mr. Brown will succeed James D. Cunningham, president of Republic Flow Meters Co., of Chicago.

A mechanical engineer and attorney at law, specializing in patent, trademark and copyright litigation before the United States courts, Mr. Brown became a member of the society in 1928, He served as manager of the ASME in 1943-44, and vice president, 1945-47 and 1947-49, and has been active in the affairs of the Southern California Section of the society.

Mr. Brown is a member of the bars of the U. S. Supreme Court and federal and state courts in Illinois, District of Columbia and his native state. Mr. Brown belongs to the International Adventurers Club, Society of Motion Picture Engineers, Society for the Advancement of Science, and National Aeronautic Association.

Regional vice presidents nominated

Henry Reginald Kessler, manager, Republic Flow Meters Co., New York. Stephen Dewey MoxLey, vice president, American Cast Iron Pipe Co., Birmingham, Alabama.

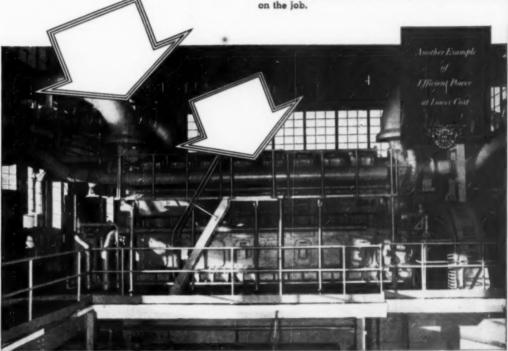
Dr. John T. Rettaliata, dean of en-



In planning one of the most modern power plants of its kind. Arizona-Edison was quick to take advantage of the latest developments in engine design and performance. Cooper-Bessemer takes pride in not only introducing these developments but in furnishing the two supercharged gas-diesels that power this outstanding plant at Yuma, Arizona.

One of these engines is shown below—a well-proved type LS, featuring the new space-saving "V" design hence called the LSV. This supercharged, 16 cylinder gas-diesel not only achieves a new low in fuel consumption (6.500 B.T.U./hp/hr, or less) but its "V" design virtually doubles the power-to-space ratio, Still another feature is simple, fast conversion to 100% gas. spark-ignited operation , , , at will!

Weigh the immediate and continuing value of these advancements and you'll appreciate that new economy is indeed the keynote at Yuma. It is new economy that can be yours. too, with modern Cooper-Bessemers on the job.



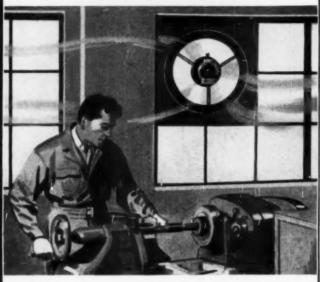
♠ Power for Arizona-Edison's new Yuma plant is supplied by two modern Cooper-Bessemer gas-diesels: a supercharged. 16 cylinder 3,300 hp type LSV engine (shown here) and a supercharged. 8 cylinder. 1650 hp in-line LS. Both engines are quickly convertible to spark-ignited operation on 100% gas fuel.

7he Cooper-Bessemer Corporation

New York City Washington, D. C. Bradford, Pa. Chicago, III.
San Francisco, Colif, Houston, Dallas, Greggton, Pampa and Odessa, Texas
Seattle, Wash. Tulsa, Okla. Shreveport, La. St. Louis, Mo. Los Angeles, Calif.
Caracas,

MOUNT VERNON, OHIO - GROVE CITY, PENNA.

It pays to Fam-Plan* with EMERSON-ELECTRIC **Exhaust Fans**



*Fan-planning means the selection and placement of fans to ventilate your buildings most effectively and economically. Costs of Emerson-Electric long-life equipment are quickly written off in terms of improved worker efficiency and public relations. Emerson-Electric's free fan-planning service brings 60 years of unmatched fan experience to your individual problems. See your electrical contractor, or write for Bulletin No. 561.

THE EMERSON ELECTRIC MFG. CO., St. Louis 21, Mo.



DIRECT-DRIVE EXHAUST FANS

Quiet-running, efficient, trouble-free fans of this type are available in five blade sizes, ranging from 12 to 30 inches. Equipped with overlapping blade assemblies, fully-enclosed ball-bearing or sleeve-bearing motors.



BELT-DRIVE EXHAUST FANS

Long-life, heavy-duty types. Quiet, low-speed models in blade sizes 24, 30, 36, 42 and 48 inches, capable of exhausting up to 19,350 cubic feet of air per minute.



gineering. Illinois Institute of Technology, Chicago.

CARL J. ECKHARDT (renomination), professor of mechanical engineering and superintendent of utilities. UNI-VERSITY OF TEXAS, AUSTIN.

Nominated as directors-at-large: LIONEL J. CUCULLU, assistant to chief engineer, New ORLEANS PUBLIC SERV-ICE, INC., NEW ORLEANS, LA.

HAROLD E. MARTIN, district manager. THE BABCOCK & WILCOX COMPANY. NEW YORK.

Combustion Engineering-Superheater, Inc.

H G ERRON and WILLIAM P E AINSWORTH have been elected vice presidents of COMBUSTION ENGINEER-ING-SUPERHEATER, INC., New York. Mr. Ebdon will continue in the capacity of general sales manager of boilers and related equipment. Mr. Ainsworth will continue in charge of purchasing and production for the company's six American manufacturing plants.

SSIRCO Expands

SOUTHERN STATES IRON ROOFING COMPANY, South-wide building material manufacturer and distributor, has announced plans for expanding its sales organization.

The company's sales area (the Southeastern States) is being divided into four sales districts, headed by district sales managers. District headquarters will be in ATLANTA, GEORGIA; BIRMINGHAM, ALABAMA; NASHVILLE, TENNESSEE; and RALEIGH, NORTH CARO-LINA. D. F. SCALES has been promoted from dealer and export sales manager to general sales manager.

LEO D. SHERIDAN has been promoted' from ORLANDO, FLORIDA sales representative to ATLANTA District Sales: Manager. His district includes the firm's branches in Savannah, Atlanta, and Albany, Ga.; Jacksonville, Orlando and Tampa, Florida.

HERBERT C. WARWICK, RALEIGH, NORTH CAROLINA sales representative for the past five years, is now Raleigh District Sales Manager. He will direct sales for the Raleigh: Columbia, S. C.: and Richmond, Va. branches.

CHARLES A. REA, sales representative in Columbia, is the new manager of the Birmingham District, comprising branches in Birmingham; Hattiesburg, Miss.; and New Orleans, La.

JOHN P. STARNES, takes over the post of NASHVILLE District Sales Manager. This district includes the Nashville and Memphis, Tenn. and Louisville, Ky. branches. He was New Orleans Manager prior to his promotion.

TECHNICAL BOOKS

Kent's Mechanical Engineer's Handbook

TWELFTH EDITION
EDITED BY COLIN CARMICHAEL
PUBLISHED BY JOHN WILEY & SONS,
INC., 440 - 4th Ave., New York,
N. Y.

In 2 volumes, 5½" x 8" x 2". Price \$8.50 each volume.

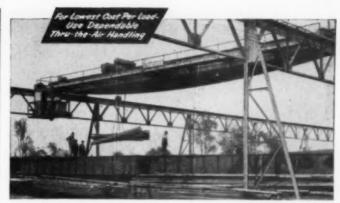
First published in 1895, this reference book, in its eleven editions, has become a standard handbook for the engineering profession. The first eleven editions were edited by William Kent and R. T. Kent. This twelfth edition, while partially organized and arranged by R. T. Kent before his death in 1947 was finally edited and prepared for publication by Colin Carmichael. Expansion made it necessary to divide the handbook into two parts for the first time in the Eleventh Edition, and the same arrangement is followed in the current Twelfth Edition.

Power Volume:

The Power Volume covers the entire field of heat-power engineering and transportation, as well as the important aspects of fluid flow.

This volume has been organized into 20 sections. The basic ingredients of any power process are covered in the first four sections. The service functions are covered in sections five and six. Power producing equipment is covered in sections seven, eight, nine, and ten. Sections eleven and twelve are devoted to refrigeration, heating, ventilation, and air conditioning. Sections 13, 14, and 15 are devoted to transportation of all types. Electric power is the subject of Section 16. Atomic energy, instrumentation, power test codes, and mathematical tables constitute the last four sections of the book.

So rapidly has technology raced forward in the twelve years since publication of the eleventh edition, that the new book has necessarily been enlarged considerably. Although much obsolete material has been deleted, the size of the volume has been increased about 20 per cent, and all material has been rewritten and revised excepting the few passages which have been refered to the size of the size of the volume has been increased about 20 per cent, and all material has been rewritten and revised excepting the few passages which have been re-

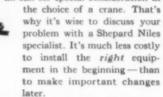


This installation required built-up plate, welded box construction . . . fish-belly design . . . enclosed cab . . . complete wentherproofing . . . main and auxiliary hoist units (see illustration below).

How to get the most CRANE for your money

When you buy a crane, make sure you select the machine best qualified to do your job! The work for a crane in your plant probably differs from that in your neighbor's plant. The general crane rating and other details which are perfect for his handling problems may not be at all suitable for yours. To get the most crane for your money, let crane duty determine your choice.

It isn't entirely a matter of capacity. Travel speeds, hoisting speeds, frequency of use—all call for special consideration in

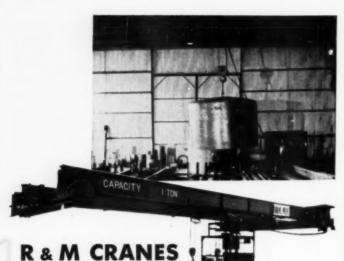




MAIN AND AUXILIARY HOISTING UNIT — Recommended for duty where there is a wide range in the capacity handled. Auxiliary hoist handles lighter loads at greater speeds than can be obtained with the main hoist. It costs you nothing to get the facts. May we place our extensive material-handling experience at your disposal?



455 SCHUYLER AVENUE . MONTOUR FALLS, N. Y.



GIVE WINGS to Boiler Company Steel

In the huge Huntington Boiler and Supply Company, loads of steel are constantly on the move. For fast, efficient, safe handling, these people use one 10-ton and two 5-ton Robbins & Myers electric overhead traveling cranes. From cars to storage, storage to work area, these R & M "giants" speed daily production schedules, help create a better profit picture.

CRANES, HOISTS, WINCHES FOR EVERY JOB

Powerful R & M units are available for lifting services from 1/4 ton to 25 tons. Many standard crane variations: gantry, over-head I-beam cranes, plus special designs for unusual applications. Also quality hoists and winches engineered for lasting service. Choice of control, suspension and capacity.

We are always glad to analyze your requirements and quote without obligation. Write for further information and free literature.

ROBBINS & MYERS • INC.

SPRINGFIELD 99, OHIO + BRANTFORD, ONTARIO
MOTORS - HOISTS - CRANES - FANS - MOTNO PUMPS

tained because of their continued value.

Design and Production Volume:

Like the Power Volume described above, the Design and Production volume has also been largely rewritten, and adequately expanded to cover advances in the field that have taken place during the past twelve years. In spite of numerous deletions of obsolete material, the total size of the book is some 300 pages longer than the previous edition.

This volume is prepared primarily for those engineers who design and manufacture machinery, appliances, mechanical equipment, and other engineered products. The 28 sections into which the book has been rearranged may be classified broadly as: Selection of Materials; Design Principles: Design and Selection of Machine Components; Production Processes: Production Plant Equipment; and Mathematical Tables. The presentation is arranged to give the engineer a quick grasp of the essentials of the field, together with pertinent technical data in condensed form. These data consist essentially of: the principles, working formulas, charts, tables, standard dimensions, proportions, and specifications. With minor exceptions the book has been completely rewritten by its 92 contributors and the many industrial concerns that have furnished data and illustrations.

A.S.T.M. Specifications for Steel Piping Materials

By A.S.T.M. COMMITTEE A-1 ON STEEL

PUBLISHED BY AMERICAN SOCIETY FOR TESTING MATERIALS, 1916 Race St., Philadelphia 3, Pa.

6 x 9 inches, paper bound—328 pages.

Price, \$3.00.

This volume is a compilation of A.S.T.M. Standards on steel piping materials, as of December 1949. It includes approximately fifty widely used specifications. Materials covered include: Pipe used to convey liquids, vapors, and gases at normal and elevated temperatures; Still tubes for refinery service; Heat exchanger and condenser tubes; and boiler and superheater tubes. Specifications for castings, forgings, bolts, and nuts are also included.

Pipe specifications cover seamless and welded; electric-fusion and electric-resistance-welded; and other types, in both carbon and alloy grades. Specifications are given for materials for service at high temperatures including austenitic pipe.

Copies of this book can be procured from the publisher.

Welding Handbook

Published by the American Welding Society, 33 West 39th St., New York 18, N. Y.

6 x 9 inches-1650 pages.

PRICE, \$12.00.

The Third Edition of this hand book covers more than thirty welding and cutting processes in use by industry today, the welding of ferrous and nonferrous metals and alloys, and the application of welding in different industries. Also included are chapters on cost estimating, welding metallurgy, physics of welding, a dictionary of welding terms, general engineering tables, welding symbols, filler metal specifications, inspection, and other pertinent facts. A bibliography is included at the end of each chapter listing the important codes, standards, books, and technical articles on the subject covered by the chapter. Illustrations show welding equipment, welding details, and specific applications.

A.S.M.E. - Baltimore

(Continued from page 61)

The most important new design feature of the radial engine is the illustrated completely new crank shaft and connecting rod arrangement. Also new is the ignition system used for the engines operated on natural gas, a spark system being required for this fuel. The generator was designed by Donald Bohn, and it is simply a four pole generator with a number of special features. It seems to do a remarkably fine job without the use of a distributor.

There was considerable discussion of this paper, most of it attempting to refute claims made by the authors for superiority of the radial design. Several proponents of in-line or banked engines presented figures in an attempt to prove that the new engine, while perfectly satisfactory and of good design, offered no advantages in

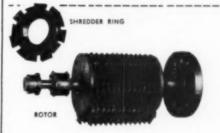
SHREDDER RING ACTION— Finance Acc. ACTION— Finance Acc. Finance Ac

the "WHY" of Uniform Coal Sizing with

AMERICANS . .

Efficient coal firing depends upon uniform sizing. That's why so many power plants use American Crushers — with exclusive Shredder Ring Action. Thrust outward against the coal by centrifugal force, the flexible rings maintain constant, controlled contact . . . to split the coal—not crush it. The result is a uniform product with controlled fines that assures a loose, uniform, quickly responsive firebed — without excessive ashpit drop or unnecessary CO₂.

Minimum headroom requirements and independence from auxiliary crushing permit easy, economical installation without extensive alterations.



American Crusher's manganess steel shredder ring and rotor assembly — for rapid reduction at low, powersaving speeds. Each ring has 20 cutting edges . . . revolves an individual shaft, free to deflect from tramp iron without demage.

Send for your copy of "Crushing Coal for Less than 1c per Ton"

Originators and Manufacturers of
Ring Crushers and Pulverizers

St. Louis 18, Mo.

THERE'S

No Reducing Problem



Their experience proves that Masoneilan valves eliminate pressure reducing problems.

No. 11 for steam service — Sizes ¾" to 4". Reduced pressure ranges between 5 and 75 psi or 75 and 225 psi. Maximum working pressure 250 psi. No. 227 for water service—Sizes ¾" to 2". Reduced pressure range between 10 and 60 psi. Maximum working pressure 150 psi. Also available for air service from ¾" to 1".

Your local Mason-Neilan industrial distributor is ready to serve you from stock; or write



Mason-Neilan Regulator Company

1206 ADAMS STREET, BOSTON 24, MASS.

Sales Offices or Distributors in the Following Cities: New York - Syracuse - Chicago - St. Louis
Philadelphia - Houston - Denver - Pittsburgh - Cleveland - Cincinnati - Tulua - Atlanta
Detroit - Los Angeles - San Francisco - Salt Lake City - El Pato - Boise - Albuquerque
Charlotte, N. C. Mason-Neilan Regulator Company, Ltd., Montreal and Toronto

Visit the Fifth National Instrument Exhibit at Memorial Auditorium in Buffalo, September 18-22, 1950. See our display in Booths Nos. 418, 420, and 422. either weight or floor space occupied. One commentor indicated that it was merely a question of how you liked them, round or rectangular.

Other Papers

Most of the other papers presented at the meeting were devoted to subjects of primary interest to designers and builders of Diesel or other internal-combustion engines. There was, however, an interesting panel discussion on the last day which dealt with "Heavy Fuels... How to Burn Them... Make Them Pay." This discussion developed some interesting facts for heavy fuel users.

Boat Trip-Exhibits

A boat trip to Annapolis was scheduled for Wednesday afternoon, but even this turned into a technical session once the boat landed at Annapolis, for an inspection trip was arranged through the U, S, Naval Engineering Experiment Station. Since this laboratory is devoted largely to research on internal-combustion engines, the members making the trip had an opportunity to inspect some of the newest in ship propulsion equipment.

Especially interesting were the free-piston engines built for the navy by Lima-Hamilton Corporation. These are the first of their type built in this country, and they are in many ways different from those built by Sulzer in Switzerland a few years back. They burn a Diesel fuel and operate on a Diesel cycle, but the pistons have no connecting rods and float freely in their cylinders. The compression stroke is powered by compressed air, and power is taken off from a gas turbine propelled by exhaust gases from the Diesel. Pennsylvania Railroad has ordered a freepiston engine for use in a locomotive. It will be put in service later this year.

Twenty-nine exhibitors displayed their products in an exhibition hall in the Hotel. The booths were open from Tuesday at noon until Friday noon, and several new products, including a new Caterpillar Diesel designed to replace steam engines on cranes, were demonstrated.

NEW EQUIPMENT for Southern Industry

Belt Conveyor

J-I

THE RAPIDS - STANDARD
CO., INC., Grand Rapids,
Mich., has announced a
power belt conveyor, engineered for
service where electricity is not readily
available. The unit is mounted on
two pneumatic tires for towing behind
a truck during field loading operations or on the highway.



Conveyor is manufactured in 10 and 16 inch belt widths and 11 and 13½ foot standard lengths, with other lengths up to 21 feet available on order. It operates at any belt pitch from horizontal to 33 degrees and will handle distributed loads up to 500 pounds.

The new model is powered by a 1½ hp Continental engine mounted in a protective tubular frame. Belt is operated through an automatic centrifugal clutch, giving speeds from 40 to 70 fpm.

Expansion Joints

J-2

CHICAGO METAL HOSE
CORPORATION, 1306 South
Third Ave., Maywood,
Ill., has announced production of
packless, in-line, corrugated expan-



sion joints to control expansion and contraction caused by temperature changes in pipelines. Joints are available in two types—Controlled-Flexing joints with control rings for high pressure; Free-Flexing joints without control rings for lower pressures.

These joints are designed for use in trenches, tunnels, and other locations where space is limited. They are made of copper, stainless steel, or other alloys, and are available in size range from 3" I.D. to 24" I.D. Units are fabricated with single or multiple corrugations and with or without control rings. They may be had with flanged or welding ends. The joints are available to meet individual requirements.

Free additional information is available to readers of Southern Power & Industry. Check item code number on the postage free service coupon post card provided on p. 17.

Steam Circulation System

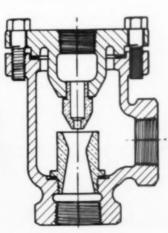
J-3

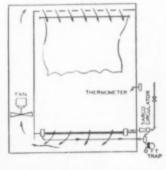
SARCO COMPANY, INC., Empire State Building, New York 1, N. Y. has introduced a new steam circulation system which improves the efficiency of the following types of steam heated equipment: 1. platen presses in the plastics and rubber industries; 2. heaters for drying machines for textiles, etc.; 3. tublar heaters of stills and evaporators.

The flow of steam and condensate in the steam spaces of these types of equipment is naturally sluggish, thereby causing a reduction in the rate of heat transfer. The new circulation system creates a turbulent flow of the steam and condensate that results in an even surface temperature and an improved rate of heat transfer.

The Sarco Circulating System consists of a Sarco Float Trap and a Sarco Circulator. The illustrated Circulator is an injector which uses the uncondensed steam to induce turbulence in the flow of the condensate, thus improving the heat transfer and speeding up production with a saving of steam.

Technical bulletin No. 4, containing full information and many easy-toread diagrams, is available upon request.





The Sarco Circulator is shown at the left. Above: section of dryer equipped with the new steam circulation system.

Squaring Shears

J-4
WORKS, Buffalo, N. Y.,
is producing a new line
of power shears designed to give the
small sheet metal shop and the heating and air conditioning contractor
a quality power shear at an attractive
price.

Fabricated completely from formed steel plates, the new shears are sleek, massive, and built low-to-the-floor. Four cutting edge knives are used in place of single cutting edge knives, so no down time is lost waiting for



the dull knife to be reground. By simply rotating the knife to a new cutting edge, it is possible to get four times as much use between regrinds.

Convenient gaging is assured by

the front gages, side squaring gages, and by a precision ball bearing, self-measuring back gage which can be intervals of 1/128 inch increments.

An electric foot switch can be furnished for remote control of the shear. A new Hi-Power Drive features a completely enclosed transmission in which all mechanisms including clutch, gearing, flywheel and detent operate continuously in a bath of oil. The entire drive and main shaft operate on anti-friction bearings.

Improve Your Products-Cut Costs

Stampings
Stampings

made to your specifications from top-quality DIXISTEEL

DIXISTEEL Forgings and Stampings may be the answer to lower production costs and improved products for you — just as they are for many Southern manufacturers and fabricators.

Made from open-hearth DIXISTEEL—quality controlled from ingot to finished product—positive assurance of correct chemical and physical properties to meet your specifications.

Blanked and formed parts are manufactured on the latest-type presses ranging in capacity up to 250 tons. Closed die forgings up to 20 pounds are produced on modern drop hammers.

Complete, modern upsetting, trimming, threading, punching, hot-bending and de-scaling round out the comprehensive facilities available to you.

Without obligation to you, let us furnish details and estimates on your particular problems. Write or telephone collect today.

COMMERCIAL HEAT-TREATING FACILITIES

For Parts up to 36 inches in diameter, 72 inches in length. Annealing, Normalizing, Tempering, and Carburizing.

Atlantic Steel Company

MAKERS OF DIXISTEEL SINCE 1901

Electric Cable Hoists

J-5

THE OHIO ELECTRIC MFG.

Co., 5900 Maurice Ave.,
Cleveland 4, Ohio, has
introduced a new line of heavy-duty
electric cable hoists ranging in lifting
capacity from ½ to 5 tons.

The manufacturer states that design of the Bob-Cat hoist, with the motor totally enclosed within the cable drum, reduces over-all dimensions and results in a substantial weight saving over units having external-type overhanging motors. In addition, the motor is fully protected against weather, moisture, dust and corrosive atmospheres.

Load sustaining parts are made from steel forgings and castings. The high-torque motor and gears run in ball bearings. Gear reduction is accomplished by means of a double internal gear train that incorporates two load brakes. The motor brake is of the equalizing solenoid type connected to an up-limit cutoff switch.

The unit is designed for operation on 220, 380, 440 or 550 volt, 3-phase, 60-cycle current.



To obtain free information on this equipment, circle number on the page 17 free post card.

Bag-Type Dust Collector

J-6

TURNER & HAWS ENGINEER-ING Co., 87 Gardner St., Boston 32, Mass., has designed a new bag-type dust collector which features automatic, continuous cleaning. According to the manufacturer, it has a 99.9 plus per cent dust collecting efficiency. Collector structure is 50 to 75 per cent smaller and lighter in weight than previous models handling the same volume. Filtering rates run as high as 60 fpm.

The unprecedented dust collecting efficiency of Arroturn Dust Collectors allows greater recovery of finest dust particles at higher filtering rates than ever before possible. Dust nuisances are eliminated, costs for plant and machinery maintenance are reduced.

The automatic filter bag cleaning feature eliminates manual attention for cleaning, and expensive weekend cleaning labor costs. Space requirements are at a minimum for given air handling capacities. Large savings can be realized in heating and/or cooling expense by recirculating filtered air, rather than exhausting to the outside. Aeroturn Collectors can be supplied in sizes and arrangements to suit any installation requirements inside or out.





with HOFFMAN

Heavy-Duty Vacuum Cleaning

Increased Productivity: Must machines and production workers stand idle while you attempt plant cleaning with old-fashioned methods? Or do you risk breakdowns and rejects while dust, metal chips and dirt accumulate in vital machinery and on production operations? Hoffman heavy-duty Vacuum Cleaning enables you to clean on regular periodic schedule, often during plant operations! Flexible tools and powerful suction remove dirt and dust from overhead areas, walls, floors quickly, thoroughly.

Better Quality Control: Is recurrent dust causing product damage—wasting valuable labor and materials? Hoffman Vacuum Cleaning has the answer to a higher rate of successful inspections. In all types of industrial plants Hoffman equipment is contributing to higher quality in the finished products; valuable materials are being salvaged. Let us consult with you on your problem.

Reduced Fire and Health Hazard: Is the nature of your dust sapping your workers' health and efficiency—creating a possible fire and explosion hazard? Perhaps taxing you with excess insurance? Then investigate how you can combat dust effectively, conveniently with Hoffman Vacuum Cleaning. Scores of industries rely on Hoffman equipment for safeguarding their men, machines and material against dust at overall low cost.

Write for Your FREE Survey

Hoffman builds stationary and portable vacuum cleaning equipment. For details, consult the Hoffman agent near you:

ATLANTA, GA.: A. J. Kreeg, P. O. Box 9, Shehion E DALLAS, TEX.: Tere & Ree Co., 5542 Dyer Street EL PASO, TEX.: Bayd Engineering Co., 718 N. Shenfon St. HOUSTON, TEX.: Haylett O'Neill, 2510 Trevis Street HUNTINGTON, W. Va.: H. Y. Kecsler, Baz 1448 KNOXYILLE, TENN.: Leinart Engineering Co., P. O. Baz 500 LYNCHBURG, Va.: Cempbell King Co., P. O. Baz 250 LYNCHBURG, Va.: Cempbell King Co., P. O. Baz 275 MEMPHIS, TENN.: Creing Sales & Engi Go., 1101 Poplar NEW ORLEANS, LA.: H. J. Kelly, 816 Howard Avenue



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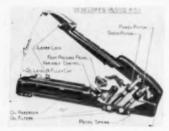
92 EAST 1211 STREET. NEW YORK 3. N. Y.

CANADIAN PLANT CANADIAN HOFFMAN MACHINERY ED. 170 NEWMARKET ONT

Hydraulic Jack

J-7

WHITCL INDUSTRIES,
Lewis St., Eatontown, N.
J., are now producing
the "Go-Jack" pump unit, a precision
made tool developing up to 20 tons
pressure. The unit is suited to the
assembly or disassembly of large



part, force fitted parts, and other machine shop and repair shop applications. It can be adapted to or built into existing machinery.

Since the device is foot operated, both hands of the operator are free to do the work normally requiring an assistant. A patented selector valve allows the operator to choose either of the two speeds required for his work.

All working parts are made of heat

FREE READER SERVICE

To obtain free information on this equipment, circle number on the page 17 free post card.

treated, polished and ground steel. Bulky parts are of cast aluminum alloy. The unit weighs 10 lb. Full specifications can be obtained from the manufacturer.

Feed Control

J-8

THE PERMUTIT COMPANY,
330 West 42nd St., New
York 18, N. Y., is producing a new electro-chemical feed
control for use in feeding chemicals
continuously and proportionately to
the flow of water entering a tank.

Water flows through an integrating raw water meter. Integrator makes an electrical contact when a predetermined quantity of water has passed through the meter, thus starting the control unit and a time switch which limits the operating time of the control unit. The quantity of chemical solution fed can be varied by manual-

ly adjusting a knob on the dial of the time switch. The quantity of chemicals fed may also be varied by changing the density of solution in the chemical tank.



The dial gauge is part of the chemical control unit and is in the operator's view at all times. Where desired, a remote dial control can be purchased and mounted on a panel board. The second gauge will synchronize with the dial gauge on the control unit.



ROLL BARREL
THE BARREL

Cooperage department settles dust problem with LIBERTY ENGINEERING SYSTEM

In the cooperage department of one of the nation's largest distillers, fine dust was a big problem . . . both inside and outside the plant. Liberty Engineering installed cyclone collectors and a "Roto-Clone" to stop the "wood flour." The management is happy and so is the neighboring residential district which was formerly exposed to the very

ciential district which was termerly exposed to the very fine dust from the plant. This is but a single example of the way industrial prob-

This is but a single example of the way industrial problems are solved by Liberty Engineering & Mfg. Co. Submit your dust collecting, cooling, air conditioning and ventilating problems to our experts for analysis.



1454 South 15th St.

A Division of The Kirk & Blum Mfg. Co.





High grade gas, by-product, steam and household stoker coal from Wise County, Virginia, on the Interstate Railroad.



High grade gas, by-product, steam and domestic coal-Pitts-burgh seam from Irwin Basin, Westmoreland County, Penn-sylvania, on the Penna. Railroad. Penn-



High grade gas, by-product, steam and domestic coal from Wise County, Va., on the Interstate Railroad



High volatile domestic, steam and by-product coal from Boone and Logan Counties, W. Va., on the Chesapeake & Ohio Ry.



High grade, high volatile steam and by-product coal from Wise County, Va., on the Interstate Railroad. A laboratory controlled product



Genuine Pocahontas from McDowell County, W. Va., on the Norfolk & Western Railway.



blended to meet exacting stoker requirements. From Wise County, Va., on the Interstate Railroad. The Premium Kentucky High LYNCO Splint unmatched for domestic use. Produced in Harlan



High fusion coking coal for by-product, industrial stoker and pulverizer use from Wyoming Co., W. Va., on the Virginian Ry.



Kentucky, on the County, Kentuck Roda and Stonega from Wise COKE

ANTHRACITE

Hazle Brook - Premium Lehigh Raven Run - Premium Mahanov

Capable engineering personnel and the experience gained through long and varied marketing activity assure proper application of one of the above brands and effective servicing of any fuel requirement.

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WORM GEAR SPEED REDUCERS

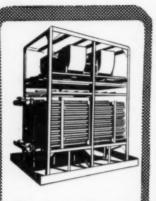
A right angle unit built for heavy duty performance in any A right angle unit built for heavy duty performance in any industry. The worm can be above or below the goar, 3hafts are industry. The worm can be above or netow the year, amorts are single or double extended for coupling connections or choice or

They are built in ratios from 4 to 3 to 90 to 3 and in capacities from 14 to 100 H.P. Bulletin No. 68 covers selection tables and dimensions.

W. A. JONES FOUNDRY & MACHINE CO. 4419 W. Roosevelt Rd., Chicago 24, III.



Herringbone - Worm - Spur - Gear Speed Reducers Pulleys . Gears . V-Belt Sheaves . Anti-Friction Pillow Blacks · Friction Clutches · Flexible Couplings



How to Improve Operating Efficiency of Evaporative Condensers

SOONER or later make-up water, used in evaporative coolers and condensers, becomes slime-laden. Quick remedy is needed here to maintain trouble-free operation of air conditioning equipment. A most effective way to fight slime and side-step trouble is water-treatment with OAKITE SANITIZER No. 1.

This new, germicidal agent of the quaternary ammonium type destroys bacterial organisms and discourages slime growth.

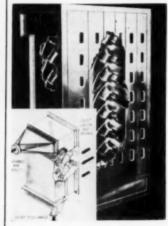
FREE: Handy 20-page Guide contains many practical suggestions on low-cost maintenance of air conditioning and refrigerating equipment. Send for Booklet No. F 7383. No obligation.

OAKITE PRODUCTS, INC. 23 Thames St., N. Y. 6, N. Y.



Technical Service Representatives Located in Principal Cities of United States and Canada **Dust Collector**

DUSTEX CORPORATION, 1758 Walden Ave., Buffalo 21, N. Y., is now manufacturing a new design in multiple cyclone-type dust collectors. The collectors, which on many applications, previously required outdoor discharge, now return cleaned air to working areas, and are constructed without moving components or filters. Manufacturer states that the unit, known as the "Dustex", has obtained efficiencies of 100% at 12 microns on dust having a specific gravity of 2.54, and is designed to operate effectively at unusually high tempera-



New design features include larger tubes adaptable to a variation of assemblies; a hinge to allow for easy opening; inlet and internal air passage designed to prevent build-up and provide for low maintenance and uninterrupted service.

The collectors are manufactured in stainless steel, aluminum, carbon steel, abrasive resistant steel, and other alloys for use in diversified industries.

Fork Truck

J-10

ELWELL-PARKER ELECTRIC Co., Cleveland, Ohio, is producing a medium-weight electric

power fork truck for handling loads weighing up to 4000 pounds.

In tiering operations this truck lifts to a base height of 130 inches in 26 seconds. The manufacturer states that going up light, the fork attains



the full height in 15 seconds, and it lowers a capacity load in 16 seconds. Travel speed on straight-away with full load is 5½ miles an hour. Lift cylinder is above vision point when load is elevated.

The truck's overall length with 36 inch fork is 116 inches; width 41 inches; height with uprights telescoped 83 inches. It has a short turning radius, 74 inches in intersecting aisles; 134 inches in right-angle aisles.



636 So. Federal Street, Chicago 5



To obtain free information on this equipment, circle number on the page 17 free post card.

Stoker

J-II THE FYR-FEEDER ENGINEERS, DIV. AMERICAN COAL BURNER CO., 18 East Eric St., Chicago, Ill., announce FYR-FEEDER automatic low cost burning systems.



Efficient combustion of low cost fuels, wood chips, sawdust or the lowest price sizes of coal can be burned with highly satisfactory results.

Masonry Saws

J-12

CLIPPER MANUFACTURING
COMPANY, 2800 Warwick,
Kansas City 8, Mo., announces a new design in masonry
saws, incorporating the Save-A-Blade
Dial.



The new device instantly adjusts blade cutting pressure by a single setting of the dial to conform to the hardness or softness of the material. It may be instantly set for: brick or tile; concrete products; or glass and marble.

All of the nine different Clipper models priced from \$195.00 will be equipped with the new Save-A-Blade dial except Model C.

Pritchard's New HYDRYER*

GAS EQUIPMENT

AIR COOLED

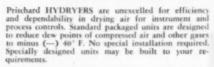
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QUALITY

EQUIPMENT



- For Efficient Drying of Compressed Air and Other Gases
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- Only Service Connections Required



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A Simple Dependable

MOTOR OPERATED VALVE!



If YOU are looking for a simple, economical, and dependable motor operated flow control valve, you can't beat the Davis No. 300. It is equipped with a standard motor assembly, connected directly to the valve stem. Because the motor is adaptable to stem. Because the motor is adaptable to spoular for steam or hot water heating system service, particularly where zone control is desired. Also used extensively to shut off house or processing water supply, in event of fire, diverting entire water supply to automatic sprinklers, operation being accomplished through the sprinkler alarm system.

No. 300 is available in sizes from ½" to 6". Balanced or single seated inner valves for various service requirements. Other designs for higher pressures and larger sizes. Bulletin on request.

DAVIS REGULATOR COMPANY

2507 S. Washtenaw Ave., Chicago 8, III.



ASK FOR NEW CATALOG A-50 AUTOMATIC PRESSURE, FLOW,

AND LIQUID LEVEL CONTROLS



BELMONT GASKETS

SEAL BETTER LAST LONGER MOLDED, FORMED, EXTRUDED, DIE OR LATHE CUT...

in sizes, shapes, and forms to meet every requirement. You can get Belmont standard and special design gaskets made of compressed asbestos, waven asbestos metallic, red rubber, cloth inserts, black rubber, vegetable fibre, cork-vegetable fibre, gray rubber, neoprene, and a wide variety of compounded materials.

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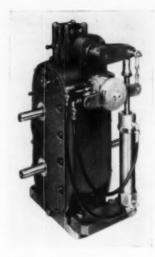
for Steam, Water, OIL, GAS, AIR, ACIDS, ALKALIES, AMMONIA. RINGS, SPIRALS, COILS, REELS, SPOOLS, SHEETS, GASKETS. Carbide Drills

ROCK BIT SALES & SERVICE
Co., 2514 East Cumberland
St., Philadelphia 25, Pa., is
producing tungsten-carbide insert
drulls in two types. The first type is a
four-point, star drill for drilling holes
in all non-metallic construction ma-



terials. The other type is a chisel drill for drilling holes in non-metallic construction materials as well as being used as a chisel for inletting in all masonry materials or for scarifying.

The manufacturer states that these percussion-type drills will drill through light reinforcing rod when used with electric or pneumatic hammers.



available with these automatic controls, in eight sizes from 1 to 25 hp capacity, with speed ratios of 6 to 1, and 16 standard types including plain, motorized, single and double reduction geared units, for horizontal or vertical mounting.

Speed Controls

J-14

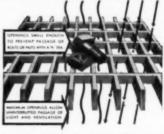
LINK - BELT COMPANY,
307 N. Michigan Ave.,
Chicago 1, Ill., has announced a new line of automatic
speed controls for their P.I.V. variable
speed drive.

These new controls are job-engineered for automatically controlling the output speed range of the P.I.V. and are available in four basic types: electronic, hydraulic (illustrated), pneumatic, and mechanical.

The uses for these automatic controls include applications where separate machines must be kept in accurate synchronization; beams, feed rolls, take-up and pay-off reels must be driven at ever-changing, variable speeds to keep tension constant in drawing, coating, impregnating, extruding and laminating materials of many sizes and kinds; operating cycles of differing lengths must be precisely timed and accurately maintained over varying periods without interruption: temperature, velocity, pressure, liquid levels and flow of materials must be held to narrow limits despite variations in operating conditions.

Whatever the industry—plastics, synthetics, textiles, paper, ceramics, chemicals, wire and rod, veneer, rubber, heat treating, metal finishing, machine tools, power plants—the P.I.V. variable speed drives are now

TRI-LOK RECTANGULAR OPEN STEEL FLOORING



Tri-Lok strength is obtained by truss action through twisted cross-bar, curved in opposite directions at each bearing-bar. Standard openings in Tri-Lok Rectangular Steel Flooring are 1" x 37_8 "—other size openings can be supplied as required.

Diagonal, or Super-Safety U-type Flooring, and stair treads of all types, are available. Bulletin KE 1140 describes the construction features of Tri-Lok Open Steel Flooring.

DRAVO CORPORATION

National Distributor for the Tri-Lok Company

Drave Bidg., Pletsburgh 22, Pa.

Sales Representatives in Principal Cities

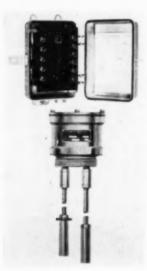


To obtain free information on this equipment, circle number on the page 17 free post card.

Level Control

J-15

RATED, 77 Broadway, Cambridge 42, Mass., has introduced a general purpose level control which the manufacturer claims to be completely maintenance-free. Contact with the liquid is made only by stainless steel probe rods. No floats or other moving parts are required in the tank.



These controls are designed for 115 or 230 volts; 50/60 cycles a-c; total power consumption ½ watt; single-pole, double-throw relay; with contacts 2 amp at 115 v a-c; 1 amp at 230 v a-c—designed for motor starter, motorized, or solenoid valve operation. Arc suppression is supplied on both contacts for increased contact life. They will operate from a resistance as high as 3500 ohms.

The instruments are available for the chemical industry as well as for the dairy and sewage fields. They are supplied as standard with either Nema 3 weather resistant housing or Nema 4 water-tight housing. Probe fittings are available to meet the requirements of all of these types of installations. In Press Operations In Shoar Operations In Conveyor Systems

CUT 'DOWN TIME'... INCREASE PRODUCTION... REDUCE OPERATING COSTS...



Here are typical comments of manufacturers using the new Manzel Automatic Spray System: Dies, punches, and shear knives wear up to three times as long! Only 1/10 as much oil now being consumed!

Punch breakage greatly reduced.

Manzel Spray Lubricators force automatically timed jets of oil spray directly onto the punches, shear knives, dies, rollers, or other parts. The system is readily installed on any type of equipment, large or small.

Manzel engineers will gladly assist you in solving any lubrication problems.

Write today for descriptive folder.

WITH MANZEL SPRAY LUBRICATION

Manzel DIVISION OF FRONTIER INDUSTRIES Inc.

318 BABCOCK STREET, BUFFALO 10, N. Y.







and Plant-Long Island City, N. Y

Electric Hoist

J-16 & HOIST DIVISION, MANNING, MAXWELL & MOORE,
INC., Muskegon, Mich., is producing
a new 1-ton capacity "Load Lifter"
electric hoist. It is designed for compactness and accessibility for easy
maintenance.

Main frame is steel and housing and covers are aluminum. There are no bearings or shaft supports inte-



gral with the covers. The motor brake is of the multiple disc type with the friction discs operating in oil. Motor mounting will receive any standard make of motor with a NEMA flange mounting. Featured in its construction are large diameter deeply grooved drums, ball bearings throughout, helical gears with 20 degree full depth cut teeth. Hoist is available for lug suspension, standard push geared type and motor driven trolleys, and for all standard electric currents.

Splash-Proof Motors

J-17

COMPORATION, P. O. Box
2099, Pittsburgh 30, Pa.,
has developed new splash-proof type
CSP Life-Line induction motors.
These squirrel-cage motors are designed for constant speed applications
both indoors and outdoors. They are



protected from ripping or splashing liquids by solid rolled-steel frames and baffles in the end brackets.

Typical applications of these motors inclue food-processing plants, chemical plants, boiler rooms, laundries, refineries, and similar places where splashing liquids are frequently encountered.

The units are available in 7½ to 100 hp; 60, 50, 25 cycles; 208, 220, 440, 550, 2300 volts; NEMA standard dimensions—frames 364 through 445.

Silicone Insulated A-C Welder

J-18

PANY, Apparatus Department, Schenectady 5, N.
Y., has announced a new siliconeinsulated, portable a-c welder known as the 6WK20H series. The manufacturer claims that a high margin of safety and operating dependability is provided by this insulation since it is unaffected by high temperatures and is water repellent.

Compact construction—12 inches by 17 inches in cross section, and 23 inches in height—permits its utilization of undarbench and balcony space not available to larger welding units. Practically averaging one-half pound per ampere of maximum output the unit weighs 154 pounds and has a current range from 30 to 250 amps, and accommodates electrodes from 1/16 to 3/16 inch diameter.



Instant arc striking without manual adjustment is provided by "Hot Start" automatic control. The standard model contains a primary switch and is designed for operation on 220 volts. Other models are available for operation on 440 volts with or without power factor capacitors.

To obtain free information on this equipment, circle number on the page 17 free post card.

Insulated Splice Caps

J-19

BUCHANAN
PRODUCTS CORP., 1290
Central Ave., Hillside, N.
J., announces the availability of new
larger sizes of splice caps with insulators, which will accommodate five
No. 14 or three No. 12 to two No. 6
wires.



The manufacturer states that the splice cap may be installed quickly and securely by means of crimping tool having uniformly converging plungers which draw splice cap and inserted wires into solid permanent mass. Installed cap is insulated by pushing molded insulator over splice cap and turning up red security ring to lock insulator firmly in place.

Cast Iron Frame Motors

J-20

THE WAGNER ELECTRIC CORP., 6400 Plymouth Ave., St. Louis 14, Mo., has announced the development of a full line of cast iron frame totally enclosed fan-cooled motors available in ratings from 5 hp through 250 hp



in both standard and explosion-proof designs.

Construction details include a cast iron frame and end plates; cast iron blower shield; corrosion resistant blower; cast iron conduit box; sealed leads; cartridge type ball bearings; completely protected laminations; special varnish treatment; cast aluminum rotor; and drain plugs in each end plate.

Air Line Lubricator

J-21

Grand Haven, Mich., has announced an air line lubricator in two sizes to provide automatic lubrication for tools using 10-16 cfm.

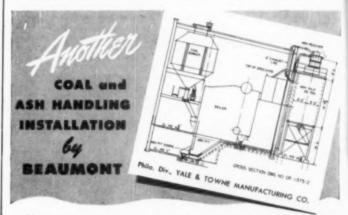
A transparent bowl, designed to hold 6 ounces of light oil, provides oil feed through a porous bronze wick. When used with a 35 cfm tool, the bowl holds enough oil for 8 to 10 weeks of lubrication under normal usage. No regulation of the oil flow is necessary.

The quantity of oil dispensed into the air stream is dependent upon the amount of air passing the wick. Several tools operating from one



lubricator will automatically draw more oil than a single tool. Under normal conditions, pressure drop through the lubricator will not exceed I lb per sq in.

Installation is made by screwing the device into a ½-inch air line ahead of the tool to be lubricated. A hex nut with holding chain permits easy refilling.



Here's one of the many efficient coal and ash handling installations—designed, manufactured, installed by Beaument. The above system is operating at the Philadelphia plant of Yale & Towne Manufacturing Company. This plant saved both time and expense—through one-confract-economy... But you're right! B's up to us to convince you of the advantages in a Beaument installations. So let us send you our folder of typical installations. Write to:



DESIGNERS - MANUFACTURERS - ERECTORS BULK MATERIAL HANDLING SYSTEMS

Get ready for Winter!



-GAS OR OIL

Now's the time to prepare for cold weather! Cut your power costs . . . modernization saves up to 10% on your fuel and maintenance bills. Let skilled Todd specialists engineer your boiler plant for maximum economy—either by modernizing obsolete equipment or providing a new and efficient installation.





COMBUSTION EQUIPMENT DIVISION TODD SHIPYARDS CORPORATION

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Electric Chain Hoists

J-22 Harvey, Ill., has announced an improved line of Whiting electric roller-chain hoists. The re-designed hoists retain the totally enclosed, double wormgear drive of previous models.



The hoists use a spring-set, shoetype motor brake, in which the lining is bonded to the shoe. The pull cold has been relocated at the center, instead of the end, of the hoist frame, to eliminate any tendency of the hoist to tip when the control cord is pulled.

Other new features include relocation and simplification of the hoist control switch; alignment of the motor insured by locking the adaptor casting into position, and a new color scheme. The hoists are available in 1/4, 1/2, 1, and 2-ton capacities.

Diesel Engine

INGERSOLL-RAND COMPANY,
J-23

11 Broadway, New York 4,
N. Y., has announced a
new type of diesel engine in the
195-375 hp range. According to the
manufacturer the engine, known as
the TS diesel, can be made portable,
but is not automotive type; it is
small in size, but with big-engine design; light in weight; has moderate
speed, and low exhaust temperature.



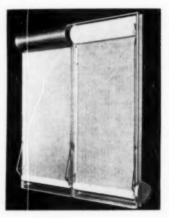
It is a four cycle, 7" bore, 8½" stroke, single-acting engine with a weight of about 30 lb per hp, and a fuel consumption of 0.40 lb per hp-hr. The engine includes many design features of the larger stationary units.

Air Filter

J-24

Co., Inc., First and Central Ave., Louisville 8, Ky., has developed the Auto-Airmat, an automatic dry type air filter. It was designed primarily for cleaning air having a high lint content and providing an easy means of disposing of the collected material. Its applications include the textile field—cleaning the air recirculated from weaving and spinning rooms—and numerous other industries requiring the removal of fibrous or flaky dust.

The unit is built in vertical sections, 3'8" wide and in heights from 5 ft to 13 ft by 4" increments. A single ply of airmat paper from a roll at top of the casing travels down the face of the filter on a rotating screen and is automatically rerolled at bottom of the casing. Movement of the supporting screen is controlled by a pressure switch. When lint and dust deposited on the exposed airmat paper cause the



resistance to air flow to rise to a predetermined point, the pressure switch closes circuit to the drive motor. The drive motor operating through a gear reducer and chain drive rotates the screen until a sufficient amount of clean airmat paper is introduced to the air flow to reduce the resistance. The dust and lint removed from the air is rolled up in the solid airmat paper for convenient disposal when this roll is discarded.

CATALOGS AND BULLETINS

These free and helpful booklets are available for the asking. Circle numbers desired on he page 17 service coupon post card.

- B-10 FURNACE INSTALLATIONS—CataDate and boiler settings in Southern industrial plants. Installations designed to convert waste materials into low-cost steam,
 7-page section on Acme designed archee and
 supporting walls.—ABOO FURNACE DIVISION, ACME BRICK COMPANY, Fort
 Worth 2, Texas.
- B-II PNEUMATIC TOOLS—Catalog 47, 24 pages—Describes Cloco pneumatic tools for industry—heavy grinders, anders, buffers, rotary file and burr machines, drills, reamers, acrowdrivers, impart weekles, etc.—CLECO DIVISION, REED ROLLER BIT COMPANY, Box 2119, Houston, Texas.
- B-12 ELECTRIC CABLE HOISTS—Bulletin, 8 pages—Covers new line of the Cat heavy-duty electric cable hoists. Illustrated with photographe, diagrams and line drawings; gives descriptions, specifications, prices and ordering data.—THE OHIO ELECTRIC MPG. CO., 5900 Magrice Avc. Cleveland, Ohio.
- B-13 PIPE AND TUBING—Catalog No. 60 pages—Information pertains entirely to bending, warehousing, and fabricating of pipe and tubing. Illustrated with equipment photographs and diagrams. Gives the property of the property o
- B-14 PNEUMATIO CONVEYORS—Bulletin A-15, 24 pages—"Airveyor" installations are illustrated and described by means of typical case histories in specific industrial plants, with applicational photographs and diagrams.—FULLER COMPANY, Catasauqua, Pa.
- B-15 STUD WELDING—Folder, 4 pages the applications of stud welding, including installation of roofing, siding, windows, and decorative panels, insulation, electrical equipment, and various types of reinforcing for concrete and gunite applications.—NELSON STED WELDING DIVISION, MORTON GREGORY CORF., LORDIN, MORTON
- B-16 UNIONS AND PARTS—Catalog 50, 28 pages—Blocks, anchor gas burn-crac thread compounds, valve handles, lubricators, fusible boiler plugs, steam gauge proceedors, resulte boiler plugs, steam gauge proceedors, resulted and derick stoves, unions and parts are supplied by the boiler of the price list included—WELL EQUIPMENT MFG, CORP., 2023 Semmes St., Houston,
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- B-18 CABLE REELEE—Booklet, 5 pages ton and its cable order accessory are described and illustrated with applicational photographa, Construction and uses are explained.—TOM NILAND EQUIPMENT CO., 19 North Hutcheson, Houston 1, Texas.
- B-19 PAINT STEIPPING Booklet. 14
 pages How to Strip Paint discusses materials and procedures designed to simplify removal of oil base and synthetic paints, enamels and similar finishes from metal surfaces. Explains method of surface preparation of parts before repainting OAKITE PRODUCTS, INC., 123A Thames St., New York 6, N. Y.
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 enclosures. Items include control desks, cubicles, electrical cabinets and enclosures,
 nower distribution control panels, switchepear
 lousings, louvres, test stands, outdoor electrical enclosures, instrument panels,—THE
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 Grove Ave., Cincinnati, Ohio.
- B-21 STEAMERS—Booklet, 8 pages—Selfcontained, completely automatic units for packaged portable steam supplies are described with recommended services and applicational photographs. Diagram shows piping arrangement.—BETTIS COIL-PORATION, 1507 Manry St., Houston, Texas.
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- systems for use in chemical, food, glass, steel, and any industry handling bulk materials. Explains operation and applications.— CONVAIR CORPORATION, Pittsburgh, Pa.
- B-26 MAGNETIC SEPARATOR Catalog No. C.1100-A, 8 pages—Descritos and illustrates application, operation, and design of the Dings non-electric, Alnice Perma-Drum magnetic separator to be used for tramp iron removal, concentration of magnetic substances from non-magnetics, purification of product from contaminating iron, reclamation of iron and scrap separaton.—DINGS MAGNETIC SEPARATOR CO., 4740 W. Electric Avc. Missuakes 14.
- B-27 NOR-RETURN VALVES Bulletin in non-return valves for steam control in case of damaged boilers or headers are described. Complete technical description, engineering diagrams of three different body and yoke patterns, a parts list, and operation and installation instructions are included. GOLDEN-ANDERSON, VALVE SPECIALTY COMPANY, Keenan Bidg. Pittsburgh 29.
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STEAM TURBINES

I—Curtis Steam Turbins No. 22805, 600 KW, 3600 RPM, form C. 4 8tage, 159 pounds steam, directly connected to General Electric Generator No. 2005-097, type ATB, 750 KVA, form T. 188 amperez, P.F. Curtis Steam Turbins No. 27244 1000 KW, 3600 RPM, form B, stage, 150 pounds steam, directly connected to General Electric General Fro. 2005506, type ATM, 125 KVA, 3600 RPM, form T, 21 ampetes, P.F. 80, 2300 rolts,

2-75 HP Moore Low Pressure Gas Turbines, Form E-2-R, 1800 RPA gas pressure 30 lb., No. 3938, Co. No. 7895 and No. 3939, Co. No. 7696 connected to -02.5 KVA Electric Machinery Mig. Co. Generators, KVA-02.5, FF 80, solits 489, amp. 75, 1800 RPM, 2 phase 60 cycle temp. rise-4m, 50, Field 56, Fenry Rating-Constant Instruction Rock 22, 17, 760, and No. 80096. Co. No. 7602. (Electiers BC-1 KW, volts FI, 12) Amp. 8, RPM 1806, Shunt Wound, Cont. 40 Deg. Rises. Nos. 1739436.

These furbines were built in 1921 and were inspected about aix months ago. The 560 KW was taken out of service June 14, 1950, and the 1960 KW is still in service and will be available August 1, 1950. The sendence and a few pumps are included.

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Pennsylvania Shipyard Barge, 28 x 94 x 10 2—350 KW Allis-Chalmers 1200 RPM, DC Generator 1—150 KW Allis-Chalmers 1200 RPM, DC Generator 1—150 KW Allis-Chalmers 1200 RPM, DC Generator 3—9 x 12 National Superior Diesel Engines 1—LI600 Cumming Superior Diesel Engine

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1—National Pressure Pump, Size 50, Model F, 30 lbs, pressure use square discharge, estupiete with 63P ager motor model 8228/144, 3 HP, 230 wit DC, 1739/513, BPM, ratio 2.41 to 1, shurt worted, ball bearnes, estupiete sections.

5-Ingersoll Rand Coolant Pumps direct conflicted to General Electric 1/6 HP, 3 phase, 68 cycle, 1140 RPM, Type 903.

 Jaccuzzi Bros. Pump with float and float red complete with General Electric motor. Model 5KH45ABI:539AX.
 HP. 1809 RPM, 115 volt. 60 cycle, single phase.

1-1½" Buffale Single Stage Pump 80 GPM, 60" head, Serial No. 228949, equipped with Lauis Altis frame 225, 3 HP, 1750 RPM

2-Allis Chalmers, Type SSLH, maxinum 45 GPM at 25' bead, minimum 10 GPM at 68' bead, centrifugat pumps with 1 HP, 3600 RPM, 220'440 volt, 3 phase, 80 9—Gil pumping units each consisting of Howell Type 88294, 1 HP, 1200 RPM, 239.440 wit, 3 phase, 60 cycle double end shaft, drip-proof taotor to each end of which is directly mounted one Brown & Shatts Gil Pump, No. 1.

1—Ingersoil Rand Model 2MRV, 4: Pump, Serial No. 86883, 200 GPM at 209 lbs. pressure, complete 8til GE Type KF404 motor, 4c HP, 3608 RPM, 229/44c volt, 3 phase, 2t cycle, Serial No. 5362346.

I-Worthington Monoblee Centrifugat Pump, Model 4DES, SN No. 1297194, complete with motor Type PA, Frame 364-29 HP, 1890 RPM, 229/449 telt. Bating of pump: Mininum 300 GPM at 110, least to 2—Gardner Denver Type GB Vertical Pumpa, Size 6, S.N. 7706S1, 1506 GPM at 56 bead; 84% efficiency, 1750 BPM, 8" succipa, 6" discharge, complete with Ceevrey BC motor, Type DNST5V 20 HP, 1750 BPM, 230 wit Dc, stab shand

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Index of ADVERTISE

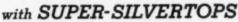
The Advertiser's Index is published as a convenience, and not as a part of the advertising contract. Every care will be taken to index correctly. No allocance will be made for errors or failure to insert.

A	E			
Adam Cook's Sons, Inc	Eagle-Picher Co. 28 and 26 Elgin Softener Corp. 10 Emerson Elec. Mfg. Co. 100 Engineer Co. 100 Eric City Iron Works 124 Ernst Water Column & Gauge Co. 91 Everlasting Valve Co. 9			
Anderson Co., V. D121	F			
Armstrong Machine Works 41 Atlantic Steel Compa. y	Fairbanks, Morse & Co			
В	Foster Engineering Co			
Babbitt Steam Specialty Co121 Babcock & Wileox (Boilers)77 Babcock & Wileox (Refractories)23	Friek Company *			
Bailey Meter Co				
Co*	G			
Co. ** Beaumont Birch Co	Garlock Packing Co			
	н			
С	Hagau Corp. 20 Homestead Valve Mfg. Co. * Hotel Pittsburgher			
Cameo Products, Inc * Carolina Refractories Co 123 Chapman Valve Mfg. Co 44				
Chicago Bridge & Iron Co 79	1			
Clarage Fan Co	Industrial Electronics Corp. 124 Inflico, Inc			
Todd Shipyards Corp116 Continental Gin Co	J			
Crane Company	Jeffrey Mfg. Co. 1 Jenkins Bros. 2 Johns-Manville, Inc. Jones Foundry & Meh. Co. W. A. 100			
Dart Mfg. Co., E. M * Davis Regulator Co				
Detroit Stoker Co 83 Diamond Power Specialty	K			
Corp. * Dowell, Inc. * Dravo Corp. 112	Kewance Boiler Corp			



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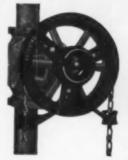
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Index of ADVERTISERS

The Advertiser's Index is published as a convenience, and not as a part of the advertising contract. Revery care will be taken to index correctly. No allowance will be made for errors or failure to insert.

	sade for errors or failure to insert.
L	Republic Rubber Division (Lee Rubber & Tire Corp.)
	Richardson Scale Co 90 Riley Stoker Corp
Liberty Engineering & Mfg.	Robbins & Myers, Inc 103
Link-Belt Co *	
LUBRIPLATE DIVISION	
Fiske Bros. Refining Co 88	
Lunkenheimer Co 7	
	S
	Sareo Co., Inc
M	Shepard Niles Crane & Hoist
	Corp
Manager Managell 6	Skilsaw, Inc Third Cover
Manning, Maxwell & Moore, Inc	Smith Corp., Winfield H 92
Mansel, Inc	Smooth-on Mfg. Co
Mason-Neilan Regulator Co 104	Southern Natural Gas Co 87 Southern Railway System
Mercoid Corp 123	Southern Railway System 22 Spraque Electric Co 22
Metalock Casting Repair	Springfield Boiler Co
Minneapolis-Honeywell Regula-	Standard Oil Co., Inc 40
ter Co.—Industrial Div 38	Standard Stoker Co., Inc 98
Minneapolis Moline *	Sterling Electric Motors Inc *
Murray Mfg. Co., D. J *	Subox, Inc
	Superior Combustion Indus- tries, Inc
	Swartwout Co., The
N	
North Alexander Co.	14
National Airoil Burner Co., Inc	T
National Aluminate Corp *	
National Boiler Protector Co., *	Taylor Forge & Pipe Works *
National Valve & Mfg. Co 34	Terry Steam Turbine Co., The. 24
Niagara Blower Co	Texas Co
Northern Equipment Company, 97	Thermix Corp
Norton Co	Tri-Lok Co
1	Trico Fuse Mfg. Co
0	U
Oakite Products, Inc	U. S. Hoffman Mchy. Corp107
Okonite Co	U. S. Treasury
p	W
	7
Pacific Pumps, Inc	Wagner Electric Co 95
Peerless Pump Division	Waldrop Corp., John *
Permutit Co. , Back Cover	Walworth Co 37
Pittsburgh-Corning Corp 90	Want Ads
Pittsburgh Piping &	Warren Steam Pump Co., Inc., 'Western Precipitation Corp '
reduchment co	Westinghouse Electric Corp *
Powell Co., Wm	Wheeler Mfg. Co., C. H
Prat-Daniel Corp.	Wickes Boiler Co 89
Pritchard Co., J. F	Wiegand Co., Edwin L 21
	Wiggins Co., John B110
	Worthington Pump & Mchy.

R

Raybestos-Manhattan, Inc.,		Υ				
Packing Division						
Republic Flow Meters Co	-	Yarnall-Waring	Co32,	33	and	8

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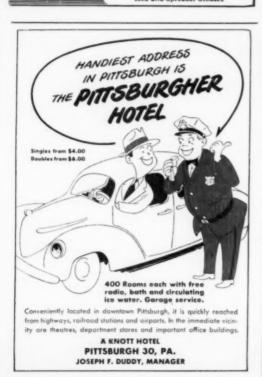
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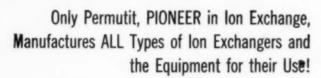
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